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JOURNAL
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ARNOLD ARBORETUM

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STUDIES IN THE THEACEAE, XV
A REVIEW OF THE GENUS ADINANDRA

CLARENCE E. KOBUSKI

THE GENUS *Adinandra* was described by William Jack in Malay Misc. 2(7): 50. 1822. At that time two Malaysian species, *A. dumosa* and *A. sylvestris,* were described. Today the type-species, *A. dumosa,* has the widest distribution and is probably the best known of all the species in the genus.

Eighteen years later (1840), P. Korthals added five new species to the genus and described at the same time *Sarosanthera,* a new genus closely related to *Adinandra.* This later genus was short-lived. It was reduced to a synonym of *Adinandra* and the single species, *S. excelsa* Korthals, was given the name *A. Sarosanthera* by Miquel (Fl. Ind. Bat. 1(2): 477. 1859), who used the specific name *Sarosanthera* since Korthals (1840) had described earlier a species named *A. excelsa.*

The generic synonymy of *Adinandra* is very simple. The only described generic synonym is *Sarosanthera,* mentioned in the preceding paragraph. However, both Szyszylowicz (1893) and Melchior (1925) in their respective treatments of the Theaceae in Nat. Pflanzenfam. listed *Haenkaea* Usteri, Ann. Bot. 6: 117. 1793, as a synonym of *Adinandra* without any explanation. In Index Kewensis (vol. 1), under *Adinandra* Jack, is cited the synonym *Haenkaea* Usteri. This is merely a mechanical error which occurred in the compilation of the material for Index Kewensis. It is strange that the earlier date 1793 caused neither Szyszylowicz nor Melchior to investigate the generic status and the possible species described under *Haenkaea. Haenkaea* Usteri, in the alphabetical arrangement of Index Kewensis, is referred not to *Adinandra* Jack of the Theaceae, but to *Adenandra* Willd. of the Rutaceae, where it truly belongs.

By 1868 nearly twenty species, all from the Malay Peninsula or Netherlands East Indies, had been added to the genus by various authors. As a result the genus was considered to be localized to these areas. In 1868 Oliver (Fl. Trop. Afr. 1: 170) described *A. Mannii* from the island of St. Thomas in the Bay of Guinea off the west coast of Africa. This species

is quite different from the majority of species in the genus and several workers have suggested the possibility of generic segregation. A close study of the entire genus shows that the variations in *A. Mannii* are not sufficient for generic limitation.

In 1874 Dyer described *A. Griffithii* from East Bengal, and in 1878 *Cleyera Millettii* Hook. & Arn., of China, was transferred to the genus, thus extending the range to its northern limits. In 1905 the genus was first recorded from the Philippines, when Merrill introduced *A. luzonica*. It received its southernmost range in 1925 when Baker described *A. Forbesii* from New Guinea.

From 1822 until 1893 there had been no attempt on the part of any worker to treat all the species of the genus in a group. Frequently the genus was listed in local floras, but further than that little was offered as a composite study.

In 1893 Szyszylowicz, in his treatment of the Theaceae for Nat. Pflanzenfam., although in very abbreviated form, listed the species of *Adinandra* and offered a key for their identification.

He introduced three new sections and separated them as follows:

Sect. I. Eleutherandra: Stamens free.
Sect. II. Euadinandra: Stamens in bundles.
Sect. III. Symphiandra: Stamens joined and disposed in a tube.

It is difficult to understand, considering the material available at the time, how Szyszylowicz could separate the species into Sections II and III. He lists *A. Sarosanthera* Miquel in Sect. III and *A. lamponga* Miquel and *A. macrantha* Teijsm. & Binn. in Sect. II. I consider all three conspecific. I have studied an isotype of *A. Griffithii* Dyer and know only on the word of the author that the stamens are uniseriate. He lists *A. Miquelii* King, a combination never made by King, under Sect. III. *Adinandra Miquelii* is a synonym of *Ternstroemia bancana* Miq.

Melchior (1925), in the second edition of the same publication, accepted the treatment of Szyszylowicz and added a fourth section as follows:

Sect. I. Eleutherandra Szyszy.: Style entire. Filaments free.
Sect. II. Euadinandra Szyszy.: Style entire. Filaments in bundles.
Sect. III. Symphiandra Szyszy.: Style entire. Filaments joined and disposed in a tube.
Sect. IV. Eleutherostyla Melch.: Styles free.

As noted, Melchior added a second character, the entire style, which combined the first three sections and separated them from his new section, *Eleutherostyla*, which was created to include *A. calosericea* Diels (1922), described three years earlier. In 1940 this new section was eliminated by the creation of a new genus, *Archboldiodendron*, to which *Adinandra calosericea* was transferred. The entire style cannot be attributed to all members of the other three sections created by Szyszylowicz because a few species are known to have styles that are three-, four-, or five-parted. *Adinandra Griffithii* Dyer (Bengal), *A. lasiopetala* (Wight) Choisy (Cey-

lon), *A. filipes* Merrill and *A. nitida* Merrill (China), and *A. Macgregorii* Merrill (Philippine Isl.) are known to have parted styles, whereas in *A. quinquepartita* Kobuski (Borneo), in which the floral parts are described from a bud, the stigmas are distinctly five in number and the style, though apparently entire, is deeply five-sulcate.

However, in his treatment Melchior states that the knowledge of the stamens is too incomplete to group the species by sections, especially in Sections II and III, and so he groups them in geographical regions, namely Ceylon, Indo-Malaya, East Asia, and Papua. This proved to be an excellent method of treatment.

After a study of all the species described to date, I find that the majority of species, save perhaps *A. dumosa* Jack and *A. Millettii* (Hook. & Arn.) Benth. & Hook., are of rather limited range. These two mentioned species, although of more extensive geographical distribution, remain in their respective areas.

Although whenever possible the stamens are described in detail, I find it unfeasible to treat the species under the sections as outlined by Szyszylowicz and Melchior. Eight out of every ten herbarium specimens, and this is a conservative estimate, have been collected in the fruiting stage, and, as a result, many species have been described from the fruit alone. Furthermore, it is difficult, in working with herbarium material, to place a species definitely in its respective section even with the stamens present.

In this study I have employed the same method of treatment as used by Melchior and feel that in this manner the species can be identified more easily. In preparing the keys, I have avoided the use of the stamen characters when possible.

Adinandra Jack in Malay. Misc. 2 (7): 50. 1822 [repr. in Hooker, Comp. Bot. Mag. 1: 153. 1835; in Calcutta Jour. Nat. Hist. 4: 207. 1843, et in Miscel. Papers Indo-China II, 2: 271. 1887]. — Korthals, Verh. Nat. Gesch. Bot. ed. Temminck 103. 1840. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève 1: 111 (Mém. Ternstr. 23). 1855. — Miquel, Fl. Ned. Ind. 1 (2): 477. 1859; Fl. Ned. Ind. Suppl. 1: 478. 1862. — Bentham & Hooker, Gen. Pl. 1: 182. 1862. — Miquel, Ann. Mus. Bot. Lugd.-Bat. 4: 103. 1868. — Dyer in Hooker f., Fl. Brit. Ind. 1: 281. 1874. — King in Jour. As. Soc. Bengal 59 (2): 187 (Mater. Fl. Malay Penin. 1: 127). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Koorders & Valeton, Meded. 'S Lands Pl. 16: 219 (Bijdr. Boomsoort. Java 3: 219). 1896. — Ridley, Fl. Malay Penin. 1: 193. 1922. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 143. 1925. — Craib, Fl. Siam. Enum. 1: 124. 1925. — Metcalf in Lingnan Sci. Jour. 11: 18. 1932. — Melchior in Notizbl. Bot. Gart. Mus. Berlin 11: 1076, 1097. 1934. — Gagnepain in Not. Syst. Mus. Hist. Nat. Paris 10: 112. 1941; in Fl. Gén. Indo-Chine, Suppl. 1: 282. 1943.

Sarosanthera Korthals, Verh. Nat. Gesch. Bot. ed. Temminck 103. 1840.

Flowers hermaphroditic. Sepals 5, imbricate, persistent, thick, concave, accrescent, unequal, gradually increasing in size from the outer lobes to the inner lobes. Petals 5, imbricate, connate at the base, glabrous or sericeous on the outer surface, the inner surface glabrous. Stamens ∞, 15–60, one- to five-seriate, adnate to the base of the corolla; filaments usually united, rarely free, unequal when 2- or more-seriate, pubescent or glabrous; anthers oblong, erect, basifixed, extrorse, hispid, very rarely

glabrous; connective projected into an apicule. Ovary pubescent or glabrous, 3- or 5-loculate, rarely 2- or 4-loculate, the ovules usually ∞ (20–100) in each locule, rarely few (4), affixed with prominent placentae. Style 1, persistent, entire, rarely 3–5-fid; stigma 1, rarely 3–5, entire or lobed. Fruit indehiscent. Seeds ∞ to few, usually minute, dark, shining, scrobiculate, the embryo inflexed, the cotyledons semi-terete.

Evergreen trees or shrubs, alternately branched. Leaves alternate, coriaceous, occasionally chartaceous. Flowers axillary, solitary, frequently in pairs; peduncles 1-flowered, recurved, seldom erect, 2-bracteolate, the bracteoles at the apex of the pedicel, opposite or alternate, persistent or caducous.

TYPE SPECIES: *Adinandra dumosa* Jack.

An amplification of the foregoing formal description, with observations on the characters used in specific delimitation throughout the genus, follows:

Leaves: Throughout the genus the leaves seldom furnish sound specific characters. Ordinarily the leaf is coriaceous. A very few species are known to possess chartaceous or subcoriaceous leaves. In size and shape one may find considerable variation on a single specimen. In most instances the leaves are obtuse, bluntly acuminate at the apex and tapering at the base. Occasionally there are consistent variations from this pattern, as found in the long-acuminate leaves of *A. acuminata* Korthals and *A. Bockiana* Pritzel and its variety, the cordate leaf-base of *A. cordifolia* Ridley and its variety, and the subsessile leaf-base of *A. subsessilis* Airy-Shaw. In these few instances specific delimitation may be based on the leaves.

The terminal leaf-buds and very young unfolding leaves possess characteristics helpful in indicating the degree of pubescence on the leaves. In any group of plants with coriaceous and evergreen leaves there is apt to be a question concerning the interpretation of the degree of pubescence of the leaves. The mature leaves may have been glabrous in the juvenile stage or they may have been extremely pubescent, later becoming glabrescent or even glabrous. In *Adinandra*, observation of the terminal leaf-bud offers an accurate means of determining the actual degree of pubescence or glabrosity of a given species. There are only a very few glabrous species, and in these cases only are the terminal leaf-buds strictly glabrous.

The veining as a whole is not an outstanding character, nor is it consistent. The majority of species fall into a group where the veins vary from 8 to 15 pairs. Very often the veins are obscure and of little use in identification. Exceptions may be found in *A. luzonica* Merrill, where even the veins of lesser degrees are of the same prominence as the primary veins, and in *A. myrioneura* Kob., *A. polyneura* Kob., *A. dasyantha* Korthals, and *A. phlebophylla* Hance, where the veins exceed more than twenty pairs in number, thereby presenting a conspicuous feature. The midrib is usually flattened or plane on the upper surface and semi-terete on the lower surface. In two species, *A. verrucosa* Stapf and *A. collina* Kob., the midrib on the lower surface is bisulcate.

Pedicels: The pedicel length is 1–2.5 cm. for the majority of species. Unless the pedicel is less than 0.5 cm. or more than 3 cm. long it can hardly be used as a delimiting factor. The pedicel is seldom erect, usually being recurved. Pubescence on the pedicel plays the same rôle as pubescence elsewhere.

Bracteoles: The persistence of the bracteoles is important. The greater number of species have persistent bracteoles, while in a smaller group of species the bracteoles are caducous. In the latter species the bracteoles may fall so early that their presence is recognized only by the scars, or the bracteoles may remain until anthesis before dropping away from the flower. Only in the persistent bracteoles and those remaining until anthesis can one find characters to be used for identification. Their position, shape and texture are of importance. In the majority of species, the bracteoles are opposite, at the apex of the pedicel, immediately below the calyx-lobes. When they are alternate, and alternate here means a variation up to 5 mm. in their positions, it is in the outer bracteole where the variation in position may be found. The inner bracteole arises immediately below the calyx-lobes, whereas the outer one is placed lower on the pedicel. In shape the bracteoles usually simulate the calyx-lobes. Often the two bracteoles vary considerably in size.

Calyx: Always persistent, the calyx-lobes vary considerably from the period of anthesis to that of mature fruit. Hence size, unless very small or exceedingly large, is of little importance. There is a marked variation in size in the lobes of a single calyx. The outer lobes are smaller, often more pubescent, and of heavier texture. In many species there is a gradation in size starting with the outer or smaller lobes and increasing in size to the largest or inner lobe. The margin of the inner lobes often is considerably more scarious than that of the outer lobes. The texture is of diagnostic importance. In the Eastern Asiatic species and those of the Philippine Islands, the texture of the calyx-lobes is of a decidedly thinner quality than can be found in the other groups or more tropical regions where the lobes are definitely thicker, often subligneous.

Corolla: The corolla remains as part of the flower for only a very short period. While still present it offers good characters in color, shape, length and pubescence. The lobes are always connate at the base; hence when dropping off the corolla falls in its entirety. White or cream is the color for the majority of species. Occasionally the corolla may be tinged with pink, and in British North Borneo and New Guinea a few species have purple lobes. In length the corolla may vary from a measurement equalling or slightly exceeding that of the calyx to three times the length of the calyx, as found in the two African species, *A. Mannii* Oliver and *A. Schliebenii* Melchior. Pubescence is an excellent character in the corolla. The species can be divided almost equally by this character. When present, the pubescence is usually of the appressed type and is concentrated on the median portion of the external surface. Occasionally one may find species where the pubescence extends over the complete

external surface. Unlike that in *Gordonia*, the pubescence is never found on the interior surface.

Stamens: The stamens offer many excellent characteristics, when present, to aid in identification. However, being adnate to the base of the corolla, they usually fall away with the corolla. They are arranged in the flower in series which vary in number from one to five. When in series, one finds that the filaments vary in length according to the number of series. The filaments are rarely free, but are connate for at least part of their length, usually that of the shortest filaments. Extreme difficulty is experienced working with dried material to determine the exact number of series. Stamens in a single series may average as low as fifteen in number (*A. Mannii* Oliver and *A. Schliebenii* Melchior), while those in several series will number as high as 55–60, as found in *A. Brassii* Kob. and *A. Forbesii* Bak. f. Variation in pubescence is considerable. In some species the filaments are glabrous, in others they are densely pubescent, and in still others one may find them pubescent on the upper portion adjacent to the anthers or on the dorsal surface only. The anthers are oblong, and with the exception of *A. Mannii* and *A. Schliebenii* are always extrorse-hispid. In only the two above-mentioned species are the anthers glabrous. In some instances an elongated apicule may be of diagnostic importance.

Pistil: Some of the best delimiting characters are found in the pistil. The style is persistent and either the ovary or fruit is present in every fertile specimen. The number of cells of the ovary has been little used even in descriptions. In immature flowers a cross-section is often difficult to obtain. In all species studied for this treatment the number of cells in the ovary and fruit are recorded. In a very few instances there is a variation within the species of number of cells in the ovary, and in such rare instances it is sometimes difficult to ascertain which is the usual number and which is the variation. The cells are for the most part quite clearly defined as to number. In several instances the placentae are of such length and consistency that they may be mistaken for cell-walls and as such they have obviously been interpreted in the past. Also, in a few species the cell-wall opposite the placentae may project so far into the cell that the branches of the placentae extend beyond the resulting indentation of the wall. A cursory study of such a dissection may very easily be misinterpreted. The fact that the ovary and the fruit are so filled with either ovules or seeds may very well lead to erroneous conclusions. Also, in rare instances the seeds may crowd the cells to such an extent that the walls are broken down and the seeds tend to displace the central axis or push into adjoining cells. However, these variations are exceptional.

The number of cells in the ovary and fruit of the majority of species is five. In all species where the ovary is five-celled the ovules are small and very many in number. The seeds, correspondingly, in the fruit are minute and usually number over a hundred. On the other hand, when the ovary and fruit are three-celled, the number of ovules and seeds is fewer and the seeds are larger than those in the five-celled species. The seeds here

measure up to 8 mm. long and seldom exceed ten in number for the entire fruit. Exceptions to this are rare but are found in *A. javanica* Choisy and *A. lasiopetala* (Wight) Choisy, where the fruit is three-celled but the seeds are minute and for all practical purposes countless. A few species have four-celled or two-celled ovaries. Of the two-celled group, *A. subsessilis* Airy-Shaw is interesting in that a single large seed is developed in each cell of the fruit.

Pubescence of the ovary plays an important rôle in identification. When pubescent, the ovary is usually densely so. This pubescence may be evanescent and the resultant fruit may be glabrescent. However, in such instances one may always find a few stray evidences of pubescence at the apex of the fruit just below its juncture with the style.

The style may be glabrous or pubescent. If the ovary is glabrous the style is also always glabrous. However, with a pubescent ovary one may find either a pubescent or glabrous style, depending upon the species. In any given species, however, the styles are usually consistent. In the majority of species the style is entire. However, in a few instances the style is divided into three or four parts, in accordance with the number of cells in the ovary. When the style is parted the number of stigmas is the same as the number of parts to the style. In a few species the style may be entire and the stigma lobed, in accordance with the number of cells in the ovary. In other species the style may be entire and the stigma distinctly five-parted.

The following review of species has been divided into five geographical groups, namely: (1) Eastern Asia; (2) Indo-Malaysia; (3) Philippine Islands; (4) New Guinea; and (5) Africa. Material has been borrowed from most of the leading American herbaria where the genus *Adinandra* has been deposited in abundance. Added material on critical specimens was obtained later from the Royal Botanic Gardens at Kew. The author is deeply grateful to the curators of these institutions for the privilege of examining their material. In the citations of specimens throughout this paper these institutions are abbreviated as follows:

(A) Arnold Arboretum of Harvard University.
(C) Chicago Museum of Natural History.
(G) Gray Herbarium of Harvard University.
(K) Royal Botanic Gardens, Kew, England.
(M) Missouri Botanical Garden.
(NY) New York Botanical Garden.
(PBS) Philippine Bureau of Science, Manila, P.I.
(US) United States National Herbarium.

EASTERN ASIATIC SPECIES

In reviewing the species of Eastern Asia and comparing them with those of the other geographical regions, as arranged in this study, one is impressed by the close relationship of all the species of this area and the basic similarity of their characters. Specific differentiation is not as clear

cut in this area as in the Indo-Malaysian area. Many species have been described on the basis of rather feeble variations. The focal species is *A. Millettii* (Hook. & Arn.) Benth. & Hook. Herbarium material has been rather plentiful for the Chinese species, and further material may show that the number of species listed below, although conservative, is not conservative enough.

The species described from Formosa and the Liu Kiu islands are very closely related to *A. Millettii* and its varieties. However, little could be done with these species, since the descriptions are often too meagre, and sufficient material for study lacking.

Almost equally sparse have been herbarium specimens from Indo-China. During the course of this study, there appeared a belated (although published in 1942) study of the Theaceae of Indo-China by Gagnepain (Not. Syst. Mus. Hist. Nat. Paris 10: 112–131. 1942). In this paper seven new species have been described. Fortunately, types of four of Gagnepain's species were found in the material gathered for this study and are treated in this section of the review. The remaining three, *A. annamensis*, *A. caudata*, and *A. donnaiensis*, are quoted at the end of this section. The original descriptions and citations are inserted in this paper in order to make these records as complete as possible. Material is essential before an attempt be made to relate them to better known species.

Immediately following is a chart of the characters used in separating the majority of the species of *Adinandra*. Under each element are listed the differences, and the species are recorded, whenever possible, under these differences. This chart has been helpful to me in the present study and it is hoped that it may be of assistance to other workers. Accompanying charts will be found in the two following groups.

CHART FOR EASTERN ASIATIC SPECIES OF ADINANDRA

Bracteoles		Calyx-lobes	
PERSISTENT	CADUCOUS	PUBESCENT	GLABROUS
Bockiana tonkinensis	*Bockiana*	*Bockiana tonkinensis*	*Bockiana*
epunctata	*Bockiana acutifolia*	*epunctata*	*Bockiana acutifolia*
glischroloma hirta	*filipes*	*filipes*	*Howii*
Millettii obtusissima	*glischroloma*	*glischroloma*	*laotica*
nitida	*glischroloma jubata*	*glischroloma hirta*	*nitida*
ryukyuensis	*glischroloma*	*glischroloma*	*Millettii*
Zen-Tasiroi	*macrosepala*	*jubata*	*Millettii formosana*
	hainanensis	*glischroloma*	*Millettii obtusissima*
	Howii	*macrosepala*	
	laotica	*hainanensis*	
	lasiostyla	*lasiostyla*	
	megaphylla	*megaphylla*	
	Millettii	*obtusissima*	
	Millettii formosana	*ryukyuensis*	
	yaeyamensis	*yaeyamensis*	
		Zen-Tasiroi	

Corolla-lobes		Filaments	
PUBESCENT	GLABROUS	PUBESCENT	GLABROUS
Bockiana	*glischroloma hirta*	*glischroloma hirta*	*Bockiana*
Bockiana acutifolia	*laotica*		*Bockiana acutifolia*
Bockiana tonkinensis	*Millettii*		*Bockiana tonkinensis*
epunctata	*Millettii formosana*		*epunctata*
glischroloma	*Millettii obtusissima*		*glischroloma*
glischroloma jubata	*nitida*		*glischroloma jubata*
glischroloma macrosepala			*glischroloma macrosepala*
hainanensis			*hainanensis*
lasiostyla			*laotica*
megaphylla			*lasiostyla*
			megaphylla
			Millettii
			Millettii formosana
			Millettii obtusissima
			nitida

Ovary		Style	
PUBESCENT	GLABROUS	PUBESCENT	GLABROUS
Bockiana	*Howii*	*epunctata*	*Bockiana*
Bockiana acutifolia	*laotica*	*filipes*	*Bockiana acutifolia*
Bockiana tonkinensis	*nitida*	*glischroloma*	*Bockiana tonkinensis*
epunctata	*ryukyuensis*	*glischroloma hirta*	*Howii*
filipes	*Zen-Tasiroi*	*glischroloma jubata*	*laotica*
glischroloma		*glischroloma macrosepala*	*Millettii*
glischroloma hirta		*hainanensis*	*Millettii formosana*
glischroloma jubata		*lasiostyla*	*nitida*
glischroloma macrosepala		*megaphylla*	*ryukyuensis*
hainanensis		*Millettii obtusissima*	*yaeyamensis*
lasiostyla			*Zen-Tasiroi*
megaphylla			
Millettii			
Millettii formosana			
Millettii obtusissima			
obtusissima			
yaeyamensis			

Ovary

FIVE-CELLED	THREE-CELLED
gliscl.roloma	*Bockiana*
glischroloma	*Bockiana*
hirta	*acutifolia*
glischroloma	*Bockiana*
jubata	*tonkinensis*
glischroloma	*epunctata*
macrosepala	*filipes*
hainanensis	*Howii*
laotica	*lasiostyla*
megaphylla	*Millettii*
	Millettii
	formosana
	Millettii
	obtusissima
	nitida
	obtusissima

KEY TO EASTERN ASIATIC SPECIES

A. Ovary pubescent; fruit pubescent or obviously glabrescent.
  B. Style glabrous.
    C. Calyx-lobes ovate-deltoid, long-acuminate, widest near the base; corolla-lobes glabrous.
      D. Leaves usually entire; pedicels up to 2 cm. long. (Eastern China) ..... 1. *A. Millettii.*
      DD. Leaves usually serrulate; pedicels up to 3 cm. long. (Formosa) ..... 1a. *A. Millettii* var. *formosana.*
    CC. Calyx-lobes rounded or broadly obtuse, usually blunt, occasionally rounded and sharply apiculate, not long-acuminate, widest portion remote from the base; corolla-lobes pubescent.
      D. Terminal buds, the under surface of the leaves, the current season's growth of branchlets, and the flower parts covered with a loose, spreading pubescence in varying degrees of density, not appressed.
        E. Pubescence dense, persistent on the above-mentioned parts. (Kwangsi, Kweichow, Szechuan) ..... 2. *A. Bockiana.*
        EE. Pubescence dense only in the young stages with a distinct tendency toward glabrescence at maturity.
          F. Leaves long acuminate, the margins entire. (Fukien, Hunan, Kwangsi, Kweichow) ..... 2a. *A. Bockiana* var. *acutifolia.*
          FF. Leaves obtuse at the apex, the margins serrulate. (Liu Kiu Islands) ..... 14. *A. yaeyamensis.*
      DD. Terminal buds, the under surface of the leaves, the current season's growth of branchlets, and the flower parts covered with a short appressed pubescence. (Indo-China) ... 2b. *A. Bockiana* var. *tonkinensis.*
  BB. Style pubescent.
    C. Leaves large, 20–24 cm. long, 4–7 cm. wide, the midrib on upper surface always finely pubescent ..... 3. *A. megaphylla.*
    CC. Leaves seldom 15 cm. long, the midrib on upper surface always glabrous.
      D. Flowers axillary, in twos and threes, only occasionally solitary; pubescence on under surface of leaves (especially young leaves) very long and dense, projecting beyond the margin, noticeable from the upper surface.

E. Bracteoles caducous; style densely pubescent two-thirds the entire length.
F. Pubescence on under surface of the older leaves tending toward glabrescence along the midrib and blade, maintaining denseness along the margin.
G. Calyx-lobes 6–7 mm. long, occasionally up to 10 mm. long in fruit. (Kwangtung, Kwangsi).....4. *A. glischroloma.*
GG. Calyx-lobes 11–14 mm. long. (Chekiang, Fukien).....
.....4a. *A. glischroloma* var. *macrosepala.*
FF. Pubescence on the under surface of the older as well as the younger leaves a dense ferrugineous iridescent tomentum up to 5 mm. long. (Kwangtung).....4b. *A. glischroloma* var. *jubata.*
EE. Bracteoles persistent; style densely pubescent the entire length. (Indo-China).....4c. *A. glischroloma* var. *hirta.*
DD. Flowers axillary, solitary; pubescence on the under surface of the leaves, when present, not projecting beyond the margin so as to be noticeable from upper surface.
E. Style 3-parted; pedicel ca. 4 cm. long. (Kwangsi).....5. *A. filipes.*
EE. Style entire; pedicel 2.5 cm. long or less.
F. Leaves distinctly dark punctate-dotted on the lower surface; ovary and fruit 5-celled. (Hainan, Kwangtung).....
.....6. *A. hainanensis.*
FF. Leaves without dark punctate-dots on the lower surface; ovary and fruit 3-celled.
G. Bracteoles caducous. (Formosa).....7. *A. lasiostyla.*
GG. Bracteoles persistent.
H. Pedicels short, seldom over 0.7 cm. long; filaments pubescent; fruit small (ca. 5 mm. diam.), the seeds normal in size (2–3 mm. long), but few (9–10) in number. (Hainan).....8. *A. epunctata.*
HH. Pedicels up to 2.5 cm. long; filaments glabrous; fruit many-seeded (100 or more). (Formosa).....
.....1b. *A. Millettii* var. *obtusissima.*
.....15. *A. obtusissima.*
AA. Ovary and fruit glabrous.
B. Entire plant glabrous, except for the terminal buds and the branchlet growth of current year.
C. Ovary and fruit 5-celled. (Indo-China).....9. *A. laotica*
CC. Ovary and fruit 3-celled.
D. Style 3-parted; calyx-lobes ca. 15 mm. long, 7–9 mm. wide; bracteoles persistent. (Kwangsi, Kwangtung).....10. *A. nitida.*
DD. Style entire; calyx-lobes ca. 8 mm. long, 5 mm. wide; bracteoles caducous. (Hainan).....11. *A. Howii.*
BB. Under surface of the leaves, pedicels, and calyx-lobes, as well as the terminal buds and branchlets pubescent. (Liu Kiu Islands).....
.....12. *A. ryukyuensis.*
.....13. *A. Zen-Tasiroi.*

1. **Adinandra Millettii** (Hooker & Arnott) Bentham & Hooker f. ex Hance in Jour. Bot. **16**: 9. 1878. — Maximowicz in Bull. Acad. Imp. Sci. St.-Petersb. **31**: 17. 1886 (excl. Liukiu ins. spec.). — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. Melchior in Nat. Pflanzenfam. ed. 2, **21**: 144. 1925. — Rehder & Wilson in Jour. Arnold Arb. 8: 177. 1927. — Metcalf in Lingnan Sci. Jour. 11: 30. 1932. — Merrill in Jour. Arnold Arb. **19**: 55. 1938.

Cleyera Millettii Hooker & Arnott, Bot. Beechey Voy. 171, t. 33. 1841.

Adinandra Drakeana Franchet in Nouv. Arch. Mus. Paris, sér. 2, 5: 208 (Pl. David. 56). 1882. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893.

Adinandra Hemsleyi Handel-Mazzetti ex Metcalf in Lingnan Sci. Jour. 11: 19. 1932, in obs., nomen.

DISTRIBUTION: China (Kwangtung, Fukien, Anhwei, Chekiang, Kiangsi, Kwangsi).

KWANGTUNG: Summit of Pakwan Mt., above Canton, *T. Sampson 15598* (G), May 1870. — White Cloud Hills, Canton, at summit, *T. Sampson 1239* (C), May 25, 1879. — Canton and vicinity, *C. O. Levine 613* (C, G, M, US), April 24, 1917, *1230* (M), Aug. 30, 1917. — Loh Fau Shan, *C. O. Levine 2069* (A, M), May 8, 1918. — Poon Yue Distr., *C. O. Levine 3199* (A, G, M), Sept. 4, 1918. — San-on Distr., Ng-Tung Shan, mountain forest, alt. 900 m., *T. M. Tsui 219* (M, NY, US), April 1932 (woody, 1 m. high with white flowers). — Lo Chong, *C. L. Tso 20446* (A), May 11, 1929 (small tree). — Near Yiu-shan, in woods, alt. 800 m., *R. Mell 769* (ISOTYPE of *A. Hemsleyi,* A), Sept. 5, 1917. — Tapu Distr., Tai Mo Shan, Wong Pan Ch'a, dry steep slope in sandy soil, *W. T. Tsang 21076* (A, NY), July 5, 1932 (shrub 2 m. with edible black fruit). — Mei (Kaying) Distr., Yam Na Shan (Yit Nga Shan), Wong Pan Ch'a Shue, along roadside of dry, clay meadow, *W. T. Tsang 21353* (A, NY), Aug. 4–31, 1932 (erect, woody, 3 m. with edible black fruit). — Wung Yuen Distr., Tsing Wan Shan, Wong chuck I and vicinity, clay thickets on steep dry slopes, *S. K. Lau 2025* (A), Aug. 16–31, 1931 (woody, 8 m.). — Hongkong, New Terr., Wu-kau tin, in open woods, *Y. Tsiang 2965* (A, C, NY, US), Aug. 13, 1929 (low shrub with deep purple fruit). — Sin-fung Distr., Lo-lo-ha village, Sha Lo Shan, abundant in forest, *Y. W. Taam 928* (A), July 1938 (7 m. high; fruit black, edible). — Hongkong, *C. Ford s. n.*, (A, NY). FUKIEN: Lui Sang, Kuliang and vicinity, rich woods, alt. 800 m., *H. C. Chen 1065* (A), July 20, 1925. — Kutien, *H. H. Chung 4021* (A, NY), May 26, 1928. — Ne Lau San, Diongloh and vicinity, wooded hillside, *Y. T. Lin 11720* (M), Aug. 6, 1926. — Yenping, Peh Men Wei, near north gate, rocky hillside, *K. H. Chou 8748* (M), Aug. 13, 1926. — Pehling, Minhow Hsien, in thickets, *H. H. Chung 2074* (A), Aug. 3, 1923 (shrub 1 m.). — Foochow, I-Su-Shan, *H. H. Chung 2814* (A, M), Aug. 13, 1924 (shrub 2 m.). — Yenping, Cha-ping, on slopes, alt. 730 m., *H. H. Chung 2846* (A), July 30, 1924 (shrub 1 m.). — Minhow Hsien, Kushan Monastery, in shady woods, *H. H. Chung 3265* (A), Aug. 17, 1923 (tree or shrub 3–4 m.). — Chuanchow, *H. H. Chung 3097* (M), April 23, 1925 (shrub). — Foochow, Kushan, *H. H. Chung 3810* (A), Aug. 18, 1925 (shrub). — Inghok, Fang Kwang Yen, *H. H. Chung 4047* (A), May 10, 1928. — Kuliang, *H. H. Chung 6445* (A), July 7, 1926 (shrub with white flowers). — Kushan, brookside, *H. H. Chung 7826* (A), Aug. 22, 1926. ANHWEI: Li Kan, along banks of partially wooded stream, alt. 100 m., *R. C. Ching 3153* (A), Aug. 7, 1925 (shrub 5 m. with smooth, gray bark). — Kimen, *N. K. Ip 7671* (US), Aug. 19, 1924. CHEKIANG: Tsing Tsien, on hill near rocks, *Y. L. Keng 79* (A), July 21, 1926 (low shrub with the fruit solitary in the axils). — Tsing Tsien, on mountain near roadside, *Y. L. Keng 144* (A), July 26, 1926 (1 m. high). — S. Yentang, shady woods, alt. 200 m., *H. H. Hu 227* (A), Aug. 26, 1920 (shrub 2–3 m. with edible black fruit). — 150 li south of Ping Yung, alt. 70 m., *R. C. Ching 1984* (A, G, US), July 4, 1924 (shrub 8 m.; nodding flowers with green calyx and corolla, pistil purple). — 15 li northeast of Tai Suan, open bushy slope, alt. 500 m., *R. C. Ching 2207* (A, US), July 22, 1924 (big shrub 7 m.). KWANGSI: Yung Hsien, Ta Tso Shan, on hillside and in forest, alt. 380 & 540 m., *A. N. Steward & H. C. Cheo 819, 905* (A, NY), Aug. 1933 (shrub or tree 6–10 m. with whitish gray bark). — Yao Shan, Ping Nan, thin woods near ridge, *C. Wang 39171* (A), May 17, 1936 (shrub with white flowers). KIANGSI: Eastern Kiangsi, *A. David s. n.* (photo of TYPE of *A. Drakeana,* A), 1873 ("petit arbre, à fleurs blanches, sans odeur"). — Lungnan Distr., Oo Chi Shan, near Lam Uk Tung village, dry steep slope in clay forest, *S. K. Lau 4424* (A, US), Sept. 1934 (5 m. high). — Kiennan Distr., Sai Hang Cheung, near Tung Lei village, *S. K. Lau 3958* (A, US), July 1934. — On trail between Kit-shan and Hong San, bushy hillside, alt. 580 m., *J. L. Gressitt 1425* (A, M), June 21, 1936 (shrub 1 m. high with pink flowers). — Hsin Feng Hsien, shady hillside, alt. 650 m., *H. H. Hu 1012* (A), May 31, 1921 (shrub 1 m. high with white flowers). — Ling Chuan, near Siang-ton-ton, in small woodland, alt. 100 m., *Y. Tsiang 9851* (NY), June 17, 1932 (shrub 1–2 m. high).

Shrub or small tree. Branchlets glabrous, terete, grayish brown, the very young branchlets and terminal buds pilose in varying degrees. Leaves coriaceous, oblong-elliptic, 4.5–9 cm. long, 2–3 cm. wide, acuminate, bluntly acuminate to nearly obtuse at the apex, acute at the base, the very young unfolding leaves densely pubescent, the mature leaves showing green, glabrous above, lighter green, glabrous or glabrescent, occasionally with light scattered appressed pubescence beneath, the margin generally entire, occasionally (on the same specimen) lightly denticulate along the upper half, the veins obvious on both surfaces but not conspicuous, the petiole short, ca. 3 mm. long, usually glabrous, rarely slightly pubescent. Flowers axillary, solitary; pedicels up to 2 cm. long, slender, glabrous; bracteoles 2, quickly caducous, alternate, near the apex of the pedicel when (rarely) present in the young buds, similar to the calyx-lobes, ca. 2 mm. long; calyx-lobes 5, imbricate, subequal, ovate-deltoid, 7–8.5 mm. long, 4–6 mm. wide, quite sharply pointed at the apex, widest at the base, glabrous or glabrescent, rarely slightly appressed-pubescent on the exterior surface, the margin subscarious, both glandular-denticulate and ciliolate; corolla-lobes 5, connate at the base, glabrous, white, similar to the calyx-lobes in size and shape, barely exceeding the latter in length, oblong-ovate, up to 8.5 mm. long, ca. 4–5 mm. wide, slightly apiculate, widest at the base; stamens ca. 25, seemingly uniseriate, rather uniform in size, 7–8 mm. long, the filaments ca. 3 mm. long, glabrous, somewhat dilated, measuring nearly 0.5 mm. across, quite free from each other, adnate to the base of the corolla, the anthers 2–3 mm. long, broadly linear, up to 1 mm. across, covered with a dense white pubescence, the apicule 1–1.5 mm. long; ovary nearly globose, tapering slightly at the apex, white-pubescent, 3-celled, multi-ovulate, the style glabrous, entire, ca. 9 mm. long, the stigma obtuse, simple. Fruit glabrescent, with evidence of some straggling pubescence, subglobose, ca. 7–8 mm. diameter, many-seeded, the seeds minute, black, shining.

Adinandra Millettii is the earliest described species of the genus from China. It has been most often collected, shows the widest distribution, and probably is the oldest Chinese species phylogenetically. In these respects it compares very favorably with the type, *A. dumosa* Jack, from Indo-Malaya.

The species itself is confined, according to the material available for this study, to the mainland of China; it ranges along the southeastern coast including the provinces of Chekiang, Kiangsi, Fukien and Kwangtung, and extends inland and westward to include Kwangsi and Anhwei.

Two varieties are found in Formosa, *A. Millettii* var. *formosana* (Hayata) Kob. (the erstwhile *A. formosana* Hayata) and *A. Millettii* var. *obtusissima* Kob. Closely allied to *A. Millettii* is the species *A. Bockiana* Pritzel and its two varieties *A. Bockiana* var. *acutifolia* (Hand.-Mazz.) Kob. (*A. acutifolia* Hand.-Mazz.) and *A. Bockiana* var. *tonkinensis* Kob. All these entities have many diagnostic characters in common, i. e. the small flowers, the calyx-lobes thin in texture, the stamens similar in number, size, shape and arrangement, the filaments showing a definite and characteristic dilation toward the anthers, and the 3-celled ovary with a distinct spreading grayish pubescence which becomes glabrescent in the fruit.

The corolla-lobes are similar in size, hardly extending beyond the calyx-lobes.

The characters separating the two species are the shape of the calyx-lobes, the pubescence on the corolla-lobes, and the leaf-shape. These characters, none too strong, are consistent, however, in the two species. Whereas, in *A. Millettii* and its varieties the calyx-lobes are always long-acuminate with the attenuation starting near the base, in *A. Bockiana* and its varieties the calyx-lobes are more rounded, occasionally abruptly apiculate but not long-tapering. In *A. Millettii* the corolla-lobes are always glabrous on the external surface whereas in *A. Bockiana* the corolla-lobes are always pubescent on the median portion of the external surface. In the latter species the leaves are larger and usually long-acuminate.

As might be expected, from the extensive range of the species, there is considerable variation in *A. Millettii*, especially in the leaves. One of the earliest collected specimens and perhaps the most cited (*Sampson 15598*, Pak-wan, Kwangtung) shows, on the same sheet, branchlets in which the leaves vary from obtuse to long-acuminate. This same variation can be found on several other specimens. Pubescence is another variable character. Generally speaking, except for the current year's growth, *A. Millettii* may be considered quite glabrous, quickly losing its early pubescence. However, in some instances this glabrescence is less extensive, hence scattered hairs may be found on the undersurface of the leaves, the pedicels, and the calyx-lobes.

In describing the stamens, Hooker and Arnott refer to the filaments as hairy and the anthers glabrous. The illustration accompanying the description portrays them thus. In the dissections made for this study, the filaments were always glabrous and the anthers pubescent. The reverse condition, as given by Hooker and Arnott, would be very unusual for this genus.

A photograph and fragment of the type of *A. Drakeana* Franchet, collected by A. David in Kwangsi in 1873 and deposited in the Museum d'Histoire Naturelle, Paris, show clearly that *A. Drakeana* is synonymous with *A. Millettii*. Probably Franchet was unaware of the existence of *A. Millettii* when he proposed his new species, because his suggested relationships are with the Indo-Malaysian species *A. dumosa* Jack and *A. integerrima* T. Anderson rather than with *A. Millettii*.

Another name, found on herbarium specimens but never adequately published, is *A. Hemsleyi* Handel-Mazzetti. Metcalf, evidently with some authority, stated that Handel-Mazzetti had abandoned this name and never published the species because he felt the relationship was too close to *A. Millettii*. *Mell 769* from Kwangtung is a representative of this distribution.

1a. **Adinandra Millettii** (Hooker & Arnott) Bentham & Hooker f. ex Hance var. **formosana** (Hayata), comb. nov.

Adinandra formosana Hayata in Jour. Coll. Sci. Tokyo 22: 45. 1906; in Jour. Coll. Sci. Tokyo 30 (Art. 1): 42. 1911. — Kanehira, Formosan Trees 51, fig. 1917; revised ed. 452, fig. 409. 1936. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 149. 1925. — Sasaki, Cat. Governm. Herb. 346. 1930.

Adinandra pedunculata Hayata in Jour. Coll. Sci. Tokyo 30 (Art. 1): 43. 1911. — Kanehira, Formosan Trees 54, fig. 1917. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 145. 1925.

Adinandra hypochlora Hayata, Icon. Pl. Formos. 3: 44. 1911. — Kanehira, Formosan Trees 52. 1917. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 145. 1925. — Sasaki, Cat. Governm. Herb. 347. 1930.

DISTRIBUTION: Formosa.

FORMOSA: Rengachi, *T. Hayashi 21213* (A), June 1924. — Bankinsing, *A. Henry 514* (A), *1583* (A, US). — Taitun, *U. Faurie 1861* (A), April 1915. — Mt. Tikusi, *T. Kawakami & Y. Simada W 9* (A), May 1915. — Taihoku, Mt. Sozan, *S. Susuki s. n.* (A), Aug. 26, 1931. — Vicinity of Kürun (Kürung), *T. Tanaka 340* (A, NY, US), Aug. 17, 1929. — Taihoku-shu, Shinten, *T. Tanaka 11178* (C, NY, US), July 24, 1932. — Taihoku, Mt. Sozan, *S. Sasaki 21627* (A, NY), Aug. 14, 1927. — Tamsuy, *R. Oldham 37* (G), 1864.

This variety differs from the species in several characteristics, none of them sufficiently consistent to warrant specific status. The leaves of the variety are usually distinctly serrate along the upper half of the margin. Generally speaking, the leaves of the species proper are quite entire. However, throughout all the material of the species examined one may occasionally find serration along the margin. The specimen of this variety most closely resembling typical *A. Millettii* from Formosa is *Oldham 37*. Here the margin of the leaves is more nearly entire with slight evidence of serration. The shape of the leaf is extremely varied. However, this same variation is found in the species. In *Sasaki 21627* one may note, on a single branch, leaves which are obtuse, bluntly acuminate, or acuminate at the apex.

The pedicels are generally longer, in rare instances attaining 3 cm. (*Henry 514*) in length. However, 2 cm. is the average length. Both the species and the variety have the same type of thin scattered pubescence on the ovary and fruit. Occasionally there is a slight evidence of pubescence at the very base of the style. This variation is not unusual in any species of *Adinandra* where there is a pubescent ovary and glabrous style. However, seldom is this variation found within the species. Hayata describes the stamens as "∞, saepius 15–17" in number. I found the number to be about 25, the same as in the species.

Authentic specimens of *A. hypochlora* Hayata and *A. pedunculata* Hayata have not been examined. Kanehira, in his revised edition of Formosan Trees (1936), lists the two as synonyms of *A. formosana*. The early descriptions, such as they are, seem to bear out this transfer by Kanehira.

1b. **Adinandra Millettii** (Hooker & Arnott) Bentham & Hooker f. var. **obtusissima.** var. nov.

A typo differt bracteolis persistentibus, oppositis (linearibus, circiter 2 × 1 mm.); foliis obovatis, basi longo-attenuatis; stylo pubescente.

DISTRIBUTION: Formosa.

FORMOSA: South Cape, *A. Henry 1985* (NY).

This variety differs from the species in (1) the obovate leaves tapering

from the middle to the base; (2) the linear bracteoles (ca. 2 × 1 mm.), persistent even on the fruiting specimen; (3) the pubescent style.

Matsumura and Hayata in 1906 listed an unnamed var. of *A. Millettii* collected by Henry on South Cape. The more definite locality of "Tamsui" was added in the citation. Probably these specimens are the same. Tamsui is not truly on South Cape but in the southern portion of Formosa, close to Ariko-banti, Ako, and Mt. Daizyurin, Takao, the type-localities of *Adinandra obtusissima*. As mentioned under *A. obtusissima* in this paper, I feel that a very close relationship exists between this variety and the species of the same name. The varietal name *obtusissima* was selected deliberately with this in mind.

2. **Adinandra Bockiana** Pritzel ex Diels in Bot. Jahrb. 29: 474 (Fl. Centr.-China). 1900. — Melchior in Nat. Pflanzentam. ed. 2, 21: 145. 1925. — Metcalf in Ling-nan Sci. Jour. 11: 20. 1932. — Chun in Sunyatsenia 4: 189. 1940.

DISTRIBUTION: China (Kwangsi, Kweichow, Szechuan).

KWANGSI: San Chiang Hsien, Ling Wang Shan, valley roadside, alt. 2100 m., *A. N. Steward & H. C. Cheo 964* (A, NY), Sept. 17, 1933 (shrub 2.5 m. high with black fruit). — N. Luchen, Chu Feng Shan, 30 li southwest of Shan Fang, in open woods, alt. 1000 m., *R. C. Ching 5838* (NY), June 8, 1928. KWEICHOW: Kiensi, Lung-kai-ching, open hillside, *Y. Tsiang 8778* (A, NY), Aug. 29, 1930 (small tree 3 m. high; leaves green above, light green below). — Yao Shan, in mixed woods, *C. Wang 40107* (A), Oct. 14, 1930 (tree 20 m. high; fruit black when ripe). — Tsunyi Hsien, Liang Feng Yah, shaded forest slope, *A. N. Steward, C. Y. Chiao & H. C. Cheo 149* (A, C, NY, US), Aug. 31, 1931 (shrub 2 m. high with leaves dark glossy green above). SZECHUAN: Nan ch'uen, Tu ma ton, *C. Bock & A. von Rosthorn 317* (TYPE, fragment and photo, A).

Shrub or small tree; branchlets terete, brown, glabrous or glabrescent, the very young branchlets densely reddish tawny-sericeous. Leaves coriaceous, oblong-ovate, 10–14 cm. long, 3–4.5 cm. wide, acuminate at the apex, the acumen 1–2 cm. long, acute at the base, the terminal buds and very young leaves densely reddish tawny-sericeous, the mature leaves deep dark glossy green, glabrous above, paler beneath covered with a soft tawny pubescence of varying density concentrated on midrib and the margin, the margin entire, lightly revolute, the veins ca. 12 pairs, obvious but not conspicuous, the petiole 5–7 mm. long, densely sericeous. Flowers axillary, solitary; pedicel slender, arching, 1–2 cm. long, densely spreading-pilose; bracteoles 2, opposite, immediately below the calyx-lobes, quickly caducous, when (rarely) present linear, ca. 4 mm. long, 1.5 mm. wide, densely pilose; calyx-lobes 5, imbricate, thin with little differentiation between the middle portion and the margin, subequal, ca. 6–6.5 mm. long, 3.5–4 mm. wide, the outer lobes broadly ovate, occasionally apiculate at the apex, the inner lobes more rounded at the apex, the margin glandular-denticulate and ciliate; mature corolla and stamens not seen; ovary globose, sparsely sericeous-pubescent, 3-celled, multi-ovulate, the style entire, glabrous, ca. 9 mm. long (post anthesis). Fruit globose, glabrescent, black, ca. 1 cm. in diameter; seeds many, reddish brown, shining.

In all the specimens examined, none had fully developed flowers for dissection. However, *Ching 5838*, in bud, upon dissection showed the corolla to be pubescent on the exterior surface. Otherwise, it appeared very similar to that of *A. Millettii*. The stamens, although minute, were 25 in number, uniseriate, lightly adnate to the base of the corolla; the

filaments were glabrous, small and free from each other; the anthers broad and densely pilose. In fact, they appeared like those of *A. Millettii* in miniature.

Adinandra Bockiana differs from *A. Millettii* in: (1) the pubescent exterior surface of the corolla; (2) the calyx-lobes of *A. Bockiana* are more rotund at the apex with the maximum width considerably above the base; and (3) the dense, tawny pubescence of the branchlets, leaves and floral parts.

Further collections may prove this species to be worthy of varietal status only. It is confined to the provinces of western China, only one collection of *A. Millettii* having been made so far from Kwangsi.

2a. **Adinandra Bockiana** Pritzel ex Diels var. **acutifolia** (Hand.-Mazz.), comb. nov. *Adinandra acutifolia* Handel-Mazzetti in Anz. Akad. Wiss. Wien 59: 105 (Pl. Nov. Sin. Forts. 16, p. 5). 1922. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925. — Metcalf in Lingnan Sci. Jour. 11: 20. 1932. — Chun in Sunyatsenia 1: 297. 1934.

DISTRIBUTION: China (Fukien, Hunan, Kweichow, Kwangsi).

FUKIEN: Yenping, Buong Kang, in bamboo forest, alt. 1000 m., *H. H. Chung 3649* (A, M), July 2, 1925 (tree 10 m.). HUNAN: Near city of Wukang, on Yün-shan Mt. in deep forest, alt. 1170 m., *H. Handel-Mazzetti 12350* (ISO-SYNTYPE, A), July 29, 1918 (shrub 2 m. with yellow flowers). - Sinning Hsien, Ma-Ling-Tung, under shade on slope, alt. 640 m., *C. S. Fan & Y. Y. Li 516* (A), Sept. 21, 1935 (tree 10 m. high with dark purple fruit). KWEICHOW: In dumetis ad pagum Badschai, alt. 950 m., *H. Handel-Mazzetti 10759* (ISO-SYNTYPE, A), July 14, 1917 (frutex elatus, fl. albis). — Tan ling, Tuhshan, in light shade, *Y. Tsiang 6893* (A, NY), Sept. 5, 1930 (tree 4 m. high; leaves deep lustrous green above, lighter below). — Kweiting, along river, in open, alt. 400–550 m., *Y. Tsiang 5464* (A, NY), June 30, 1930 (shrub; leaves deep green above, lighter below). — Yao-ren-shan, San hoa, in light woods, alt. 400–700 m., *Y. Tsiang 6394* (A, NY), Aug. 10, 1930 (common tree 3–10 m.; leaves deep lustrous green above, lighter below). KWANGSI: Shang-sze Distr., Shap Man Cha Muk, near Hoh Lung village, southeast of Shang-sze (Kwangtung border), Wong Pan Cha Muk, in dry, clay thickets, *W. T. Tsang 22486* (A), July 17, 1933 (tree 3 m. tall with edible black fruit). — Shang-sze Distr. (Kwangtung border), southeast of Shang-sze, Shap Man Taai Shan, Tang Lung village, Wong Pan Cha Shue, in swamp thickets, *W. T. Tsang 24013* (A, M, NY), Aug. 11, 1934 (common, 2 m. high; fruit black, edible). — Shang-sze Distr., southeast of Shang-sze (Kwangtung border), near Iu Shan village, Wong Pan Cha Shue, in dry silt, sandy soil, *W. T. Tsang 22167* (A), April 29–30, 1933 (scattered shrubs 2 m. tall; flowers yellow). — Kwei-lin Distr., Hsi-chang village and vicinity, Ch'i-fen-shan, Wong Pan Cha Shue, in thickets on steep slope, *W. T. Tsang 28485* (A, US), Oct. 1–11, 1937 (fairly common, 2 m. high; fruit edible, black).

ADDED DESCRIPTION: Flowers axillary, solitary or rarely in twos; pedicel usually recurved, ca. 1 cm. long, lightly strigillose or glabrescent; bracteoles 2, quickly caducous, when present linear-oblong, ca. 2 mm. long and 1 mm. wide, slightly pubescent; calyx-lobes 5, imbricate, broadly ovate, subequal, 4–5 mm. long, 3–3.5 mm. wide, glabrescent or glabrous, the outer lobes somewhat acuminate, the inner lobes more rounded at the apex, the margin glandular and ciliate-fimbriate; corolla-lobes 5, connate at the base, ca. 7 mm. long, 4.5–5 mm. wide, rounded at the apex, pubescent on the median portion of the exterior surface; stamens ca. 25, uniseriate, ca. 5 mm. long, the filaments lightly adnate to the base of the corolla, free from each other, glabrous, ca. 2 mm. long, somewhat dilated in the middle,

the anthers ca. 2 mm. long, quite wide at the base, somewhat sagittate, densely hirsute, the apicule ca. 1 mm. long; ovary subglobose, white-sericeous, 3-celled, multi-ovulate, the style ca. 8 mm. long, glabrous, entire. Fruit globose, dark purple when ripe, soft, thin-walled, ovoid, ca. 1 cm. or more in diameter, many-seeded; the seeds dark, shining.

This variety agrees with the species in most characters. The chief feature of separation is the glabrescent or glabrous character of most of its parts.

2b. **Adinandra Bockiana** Pritzel ex Diels var. **tonkinensis**, var. nov.

Adinandra Millettii Merrill in Jour. Arnold Arb. **19**: 55. 1938. — Gagnepain in Fl. Gén. Indo-Chine, Suppl. 1: 284. 1943. Non (Hooker & Arnott) Bentham & Hooker f.

A typo differt gemmis, juventutibus ramulis, pedicellis, bracteolis, calycibus pubescentibus adpressis.

DISTRIBUTION: Indo-China (Tonkin).

TONKIN: Chapa, on banks of brooks and ravines, alt. 1500 m., *A. Pételot 3751* (TYPE, NY, US), July 1930 (tree 10 m. high with very pale salmon-colored corolla). — Station du Tam Dao, alt. 900 m., *A. Pételot 3976* (NY, US), May 1931. — Chapa, alt. 1500 m., *A. Pételot 4308* (NY, US), July 1931.

Both Merrill and Gagnepain associated the specimens cited above with *A. Millettii*. However, the acuminate leaves, the broadly ovate calyx-lobes and the pubescent corolla-lobes show it to be a variation of *A. Bockiana* and closely allied to *A. Bockiana* var. *acutifolia*. The real difference lies in the pubescence. Whereas, in *A. Bockiana* and *A. Bockiana* var. *acutifolia* the pubescence is spreading, in this variety the pubescence is short and closely appressed.

3. **Adinandra megaphylla** Hu in Bull. Fan. Mem. Inst. Biol. **6**: 172. 1935; in Icon. Pl. Sin. 5: 1, t. 201. 1937.

Adinandra Petelotii Gagnepain in Not. Syst. Mus. Hist. Nat. Paris 10: 115. 1942; in Fl. Gén. Indo-Chine Suppl. 1: 289. 1943.

Adinandra serrulata Li in Jour. Arnold Arb. **26**: 66. 1945.

DISTRIBUTION: China (Yunnan, Kwangsi); Indo-China (Tonk'n).

CHINA: YUNNAN: Ping-pien Hsien, in ravine, alt. 1200 m., *H. T. Tsai 60288* (ISOTYPE, A), June 19, 1934 (small tree 7 m. high). KWANGSI: Chen Pien Distr. on slope in forest, *S. P. Ko 55926* (A), Oct. 17, 1935 (tree 8 m. high; fruit deep red). Ling Wan Distr. in light forest, *S. K. Lau 28705* (TYPE of *A. serrulata*, A), July 19, 1937.

INDO-CHINA: TONKIN: near Chapa, alt. 1800 m., *A. Pételot 3788* (ISOTYPE of *A. Petelotii*, A), Aug. 1930.

Small tree (6 m.); branchlets terete, ferrugineous-pilose; terminal buds elongate-conical up to 2 cm. long, densely appressed ferrugineous-sericeous. Leaves coriaceous, oblong-lanceolate, 16–24 cm. long, 4–7 cm. wide, acuminate at the apex, rounded to broadly cuneate at the base, the very young unfolding leaves densely ferrugineous-pubescent, the mature leaves glabrous on the upper surface except within the channelled midrib, scattered-appressed-pilose beneath in varying degrees, occasionally quite glabrescent, the margin serrulate with occasional apiculate glands varying according to the age of the leaf, the veins ca. 20–24 pairs, slightly curved, arching, more prominent beneath, the reticulations obvious, the petiole

stout, ca. 12–15 cm. long, appressed-ferrugineous-pilose above and beneath. Flowers axillary, solitary; pedicel up to 3 cm. long, thickened at the apex, recurved, appressed-pilose; bracteoles 2, quickly caducous, alternate, when present oblong, acute at the apex, 5–6 mm. long, ca. 3 mm. wide, pilose; calyx-lobes 5, imbricate, thick, unequal, broadly ovate, outer lobes 11–13 cm. long, 10–11 cm. wide, sericeous on the median portion of the dorsal surface, the inner lobes pubescent, smaller, less thick, the margins more scarious; corolla-lobes (fide Hu) "5, unequal, broadly ovate-oblong, to 13 mm. long, 7 mm. broad, slightly grey-ferrugineous-sericeous outside, glabrous inside serrulate along the margins;" stamens 40–45, seemingly uniseriate, rather uniform in size, the filaments short, thickened, ca. 2 mm. long, glabrous, the anthers ca. 4 mm. long, densely sericeous on the dorsal surface, apiculate; ovary conical, densely sericeous, 5-celled, multi-ovulate, tapering at the apex into the short blunt style which is appressed-pubescent, the pubescence thinning out towards the glabrous apex. Mature fruit not seen, maturing fruit very thick-walled.

There are several very obvious characteristics which aid in easily distinguishing this species. First, the large, oblong-lanceolate leaves 20–24 cm. long and definitely serrate; second, the large almost velvety calyx-lobes, similar in size and appearance to those of *A. glischroloma* var. *macrosepala* (Metcalf) Kob.; and third, the pubescence along the midrib of the upper surface of the leaf.

Gagnepain described the same species under the name *A. Petelotii*. There is no need for discussion because the two are obviously the same. Li's species, *A. serrulata,* was described from specimens with leaves somewhat smaller (16–20 × 4–5 cm.), but otherwise matching those of *A. megaphylla* perfectly.

Hu's original description is excellent and very detailed. He states, however, that the stamens are glabrous. Although only buds were available for dissection in this study, it is clear from these dissections that the stamens are very hirsute along the dorsal surface of the anther. Also Hu gives the impression from his description and later drawings in Icon. Pl. Sin. that the bracteoles are persistent, whereas in the two specimens examined they are obviously quickly caducous. He fails to mention that the ovary and style are pubescent and that the ovary is five-celled. His later illustration, however, depicts pubescence on these parts.

4. **Adinandra glischroloma** Handel-Mazzetti in Anz. Akad. Wiss. Wien 60: 96 (Pl. Nov. Sin. Forts. 16, p. 5). 1923. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 145. 1925. — Merrill in Lingnan Sci. Jour. 7: 315. [1929] 1931. — Metcalf in Lingnan Sci. Jour. **11**: 20. 1932.

Adinandra chinensis Merrill ex Metcalf, loc. cit., nomen.

DISTRIBUTION: China (Kwangtung, Kwangsi).

KWANGTUNG: Lochang Distr., Sei Hsien, *C. L. Tso 20328* (A, NY), May 9, 1929. — Canton, near town of Lien ping, alt. 500–900 m., *R. Mell 679* (ISO-SYNTYPE, A), Aug. 11, 1920 (very abundant). — Lung T'au Mt., near village of Iu, in ravine on side of mountain, *K. P. To & U. K. Ts'ang 12041* (M, US), May 23, 1924 (tree 2 m. high; flowers red and white). — Sing-fung Distr., Hau T'ong Shan, Fuk Lung Monastery, in thickets, *Y. W. Taam 758* (A), May-June 1938 (scattered shrubs with black edible fruit). — Mei Distr. (Kaying), Yam Na Shan (Yit Nga Shan), in dry silt, *W. T. Tsang 21387* (A, NY), Aug. 1932 (scattered shrubs ca. 3 m. tall; fruit black).

KWANGSI: Yuan Tang Shan, 15 li west of Shan Fang, N. Luchen, in forest, alt. 600 m., *R. C. Ching 5719* (A, NY), June 6, 1928 (shrub 2 m. high; leaves dark green above, paler below). — Yao Shan, in mixed woods, *C. Wang 39479* (A), *40155* (A), *40161* (A), June-Oct. 1936 (tree 10–15 m. high; fruit black).

Shrub or small tree; branchlets thick, terete, villous-pubescent, the young branchlets and terminal buds covered with a brown, more dense villous pubescence. Leaves coriaceous, oblong-elliptic, 8–14 cm. long, 3–5 cm. wide, acuminate at the apex, tapering at the base, usually cuneate, occasionally somewhat rounded, glabrous above, tawny-hirsute beneath, more densely concentrated along the margin and the midrib, the margin revolute, usually entire with occasional apiculate glands, the concentrated pubescence (extending from beneath) appearing as a halo along the edge of the upper surface, the veins 10–12 pairs, conspicuous on both surfaces, the petiole 8–10 mm. long, densely hirsute. Flowers axillary, in twos or threes, rarely solitary; pedicel 6–15 mm. long, erect or recurved, tawny-brown-hirtellous; bracteoles 2, caducous, opposite or alternate; calyx-lobes 5, imbricate, broadly ovate, 6–7 mm. long, hirtellous; corolla and stamens not seen; immature capsule 5-celled, hirtellous, the style ca. 1 cm. long, the lower two-thirds hirtellous, the upper third glabrous.

The tawny-hirtellous pubescence of the young branchlets, the under surface of the leaves and the flowering parts make this species and its varieties easily distinguishable. Concentrated along the margin, even when the leaf has become glabrescent, this pubescence projects beyond the edge of the lower surface in such quantity and to such an extent that when viewed from the upper surface it presents the appearance of a tawny halo. The species is unique in this character. Another unusual feature, for Chinese species, is the occurrence of the axillary flowers in twos and threes; only occasionally does one find solitary flowers. All material cited above is either in bud or in the post anthesis stage. Dissections of very young buds do show, even so, that the corolla-lobes are pubescent on the median portion of the external surface and are somewhat ovate in shape. The stamens, although they appear to be in series and over 30 in number, are quite uniform in size. The filaments are glabrous and the anthers hirsute.

In *Tsang 21387*, the only specimen with developing fruit, the calyx-lobes measure close to 10 mm. in length and 5–6 mm. in width.

Cited here as a synonym is the herbarium name *A. chinensis* Merrill. Metcalf (Lingnan Sci. Jour. 11: 20. 1932) mentioned this unpublished species and listed it as a synonym of his own *A. macrosepala*. Examination of Merrill's specimens shows that Merrill had designated as the type of his unpublished species Wulsin's (Canton Christian College 12041) specimen and not *Chung 3384*, which belongs to the variety *macrosepala*.

4a. **Adinandra glischroloma** Handel Mazzetti var. **macrosepala** (Metcalf), comb. nov. *Adinandra macrosepala* Metcalf in Lingnan Sci. Jour. 11: 18. 1932.

DISTRIBUTION: China (Fukien, Chekiang).

FUKIEN: Yenping, Buong Kang, in thickets, alt. 800 m., *H. H. Chung 3384* (SYNTYPE of *A. macrosepala*, A, ISO-SYNTYPE M), June 14, 1925 (shrub 3 m.). — Chung an Hsien, open hillside, alt. 1100 m., *H. H. Hu 1322* (SYNTYPE of *A. macrosepala*, A) July 23, 1921 (shrub ca. 1 m.). — No data, *H. H. Chung 7369* (A).

CHEKIANG: 80 li northeast of Tai Suan, in open thickets, alt. 800 m., *R. C. Ching 2183* (A, NY, US), July 20, 1924 (shrub 5 m. high with brownish bark). — Taishun Hsien, on mountain slope, *Y. L. Keng 312* (A), Aug. 5, 1926 (shrub 1–2 m.).

The chief difference of this variety from the species is found in the size of the calyx-lobes. Whereas, in the species, in bud, the lobes measure 6–7 mm. in length and in a single early fruiting specimen the calyx-lobes measure 9–10 mm. × 5–6 mm., in the variety, the calyx-lobes in bud measure 11–14 mm. in length. Their full development is not known.

Dissections of flowers in bud, more nearly mature than those in the species, show that, like the species, their corolla-lobes are ovate, acute at the apex, and pubescent on the dorsal surface. The stamens, many in number, appear to be seriate. The anthers are quite uniform and measure ca. 3 mm. in length. The filaments are very short and glabrous, while the apicule varies considerably in length, from 1–2–3 mm.

One may assume that, when mature flowers of the species and variety are collected, all the floral parts of the variety will be uniformly larger than those of the species.

4b. **Adinandra glischroloma** Handel-Mazzetti var. **jubata** (Li), comb. nov.
Adinandra jubata Li in Jour. Arnold Arb. 25: 422. 1944.

DISTRIBUTION: China (Kwangtung).

KWANGTUNG: Hwei-yang Distr., Shek Shing village, Lin Fa Shan, *W. T. Tsang 25601* (TYPE of *A. jubata,* A), Aug. 25–26, 1935 (scattered shrubs 2 m. high; fruit edible, black).

This variety is characterized by a beautiful, dense, ferrugineous, iridescent tomentum (sometimes as much as 5 mm. long) on the terminal buds, young branchlets, under surface of the leaves, and flowering parts. Li separated it from *A. glischroloma* Handel-Mazzetti but it appears to be nearer the variety var. *macrosepala* and except for degree of pubescence is a perfect match for *Chung 7369* collected in Fukien.

In reality, except for pubescence, this variety seems to be midway between the species and the variety *macrosepala*. In the two latter entities the pubescence is very similar. However, they both agree with var. *jubata* in type of pubescence differing only in density.

4c. **Adinandra glischroloma** Handel-Mazzetti var. **hirta** (Gagnepain), comb. nov.
Adinandra hirta Gagnepain in Not. Syst. Mus. Hist. Nat. Paris 10: 113. 1942; in Fl. Gén. Indo-Chine, Suppl. 1: 286, fig. 26. 1943.

DISTRIBUTION: Indo-China (Tonkin).

TONKIN: Chapa, alt. 1500 m., *A. Pételot 3818* (ISOTYPE of *A. hirta,* A, US), Aug. 1930.

This variety agrees with *A. glischroloma* Handel-Mazzetti in most characteristics. The flowers are axillary and like the species are in pairs, or in threes, rather than solitary. The buds are small and very hirsute. The pubescence of the leaves, although of the same type, is less dense. However, in the very young leaves, the pubescence appears more dense and typical of the species.

The characteristics which separate var. *hirta* from the species, although

of dubious importance, are: (1) the ovate-acute or deltoid, persistent bracteoles; (2) the style, pubescent its entire length; and (3) the pubescent filaments.

5. **Adinandra filipes** Merrill in herb., sp. nov.

Frutex 4 m. altus, subglaber (floribus ignotis), ramis ramulisque teretibus, ramulis ultimis 2 mm. diametro, adpresso-pubescentibus; gemmis leviter adpresso-pubescentibus; foliis coriaceis, oblongo-ellipticis, 7–10 cm. longis, 2–2.5 cm. latis, apice graciliter acuminatis, basi cuneatis, glabris, haud punctatis, margine minute apiculato-serrulatis, dentibus inter se 2–3 mm. distantibus, deorsum remotioribus, margine in partibus inferioribus integris vel subintegris, nervis primariis utrinque 12–15, gracilibus haud perspicuis, arcuato-anastomosantibus; petiolo crasso, circiter 2 mm. longo; fructibus solitariis, axillaribus, longe (4 cm.) graciliterque pedicellatis, ovoideis, circiter 1 cm. longis (immaturis) consperse pubescentibus, stylis gracilibus, circiter 1 cm. longis, breviter ciliato-pubescentibus, apice breve tripartitis; bracteolis 2, caducis; sepalis 5, imbricatis, persistentibus, reflexis, oblongo-ovatis, circiter 8 mm. longis, acutis, obscurissime adpresso-pubescentibus.

DISTRIBUTION: China (Kwangsi).

KWANGSI: Yeo Mor Shan, N. Lin Yen, rare in forest, alt. 1400 m., *R. C. Ching 7138* (TYPE, NY, tracing, A), Aug. 28, 1928 (shrub 3 m. high with gray bark; leaves deep shining green above, pale beneath.

This species, considered rare by the collector, is characterized by the slender, elongated pedicels which in fruit are 4 cm. in length, by the reflexed sepals, and the three-parted, pubescent style.

6. **Adinandra hainanensis** Hayata, Icon. Pl. Formos. 3: 43. 1913. — Melchior in Nat. Pflanzentam. ed. 2, 21: 144. 1925. — Merrill in Lingnan Sci. Jour. 6: 283. 1930. — Tanaka & Odashima in Jour. Soc. Trop. Agric. 10: 375. 1931. — Metcalf in Lingnan Sci. Jour. 11: 20. 1932.

Adinandra hainanensis Merrill in Philip. Jour. Sci. 23: 250. 1923.

Adinandra Maclurei Merrill in Lingnan Sci. Jour. 5: 129. 1927.

Adinandra rubropunctata Merrill & Chun in Sunyatsenia 1: 70. 1930. — Metcalf in Lingnan Sci. Jour. 11: 20. 1932. — Merrill & Chun in Sunyatsenia 2: 41. 1934. — Chun, Icon. Pl. Sin. 5: 3, t. 203. 1937; in Sunyatsenia 4: 188. 1940.

DISTRIBUTION: China (Hainan, Kwangtung).

HAINAN: Ch'and-kiang Distr., Ka Chik Shan and vicinity, in thickets on dry cliffs, *S. K. Lau 1486* (A, NY), *1533* (A, NY), April 8–13, 1933 (tree 3–4 m. high, 9–12 cm. diam.). — Lam Ko Distr., Fu Hoi and vicinity, *W. T. Tsang 201* (A, M, NY, US), July 29, 1927 (4 m. high). — Taam Chau Distr., Sha Po Shan, in forest, *W. T. Tsang 543* (A, NY, US), May 27, 1928 (flowers white). — Lam Ko-Chung Mai Districts, Taai Wong Shan, summit of mountain, *W. T. Tsang 711* (A, US), June 15, 1928 (2 m. high; flowers white). — Dung Ka to Wen Fa Shi, in thickets, alt. 550 m., *N. K. Chun & C. L. Tso 43778* (A, NY), Sept. 1, 1932 (tree 6 m. high, 10 cm. diam. with smooth gray branches and brownish gray branchlets, leaves dark green glabrous above, paler pubescent beneath). — Dung Ka, in forested ravine, alt. 800 m., *N. K. Chun & C. L. Tso 43930* (A, NY), Sept. 25, 1932 (tree 8 m. high with gray bark and branchlets; leaves lustrous dark green above, paler beneath). — Ng Chi Ling, Fan Yah, in thin forest, alt. 300 m., *N. K. Chun & C. L. Tso 44012* (A, C, NY), Oct. 5, 1932 (tree 8 m. high, 20 cm. diam. with gray bark; leaves deep green above). — Po-ting, in forest ravine, alt. 300 m., *F. C. How 72081* (A), April 23, 1935 (tree 7 m. high with gray bark; leaves lustrous green above, paler beneath). — Tai Pin, *J. L. Gressitt 1076*

(A), June 21, 1935 (tree 10 m. high, 15 cm. diam.). — Five Finger Mt., in wooded ravine, *F. A. McClure 9571* (A, M), May 13, 1922 (shrub 3 m. high, 8 cm. diam.). — Ching Mai Distr., Tai Wong Ling and vicinity, Tung Pin Tin village, dry sandy slope in thicket, *C. I. Lei 816* (A, NY, US), July 5, 1933. — Hung Mo Shan and vicinity, by stream, *Tsang & Fung 292* (A, NY, US), June 13, 1929 (fruit black). — Seven Finger Mt., in thicket on slope, *H. Y. Liang 61760* (A, NY, US), May 6, 1930 (tree 7 m. high with gray bark and branches). — Ngai Distr., Yeung Ling Shan, in thickets on moist clay slope, *S. K. Lau 196* (A, M, NY, US), July 2, 1932. — Bak Sa, in thickets, *S. K. Lau 26138* (A), April 8, 1936. — Loktung, in dense woods, *S. K. Lau 27209* (A), June 20, 1936. — Po-ting, in forested ravine, alt. 400 m., *F. C. How 72471, 73514* (A), May-Aug. 1935 (tree 9–25 m. high; flowers white). — Exact locality lacking, in mixed forest, *C. Wang 33649* (A, NY), Aug. 12, 1933 (tree 10 m. high). KWANGTUNG: Ta Mien Shan, Sup Man Ta Shan, in shaded woods, *H. Y. Liang 69638* (A), *69640* (A), July 14, 1937 (tree 6 m. high; fruit villous). — Weishang, Sunyi, in light shade, alt. 930 m., *Y. Tsiang 2713* (TYPE of *A. rubropunctata,* NY), June 15, 1929 (tree 7 m. high; leaves lustrous green above, light green beneath).

Shrub or small tree up to 10 m., rarely up to 25 m.; branches brown or grayish brown, terete, the very young branchlets and terminal buds appressed-pubescent. Leaves coriaceous, oblong-elliptic to oblong-obovate, 6–8 × 2–3 cm. and 10–13 × 5–6 cm., shortly acuminate at the apex, acute at the base, shining green above, paler beneath, glabrous on both surfaces, conspicuously dark-punctate beneath, the margin distinctly glandular-denticulate, the veins ca. 12 pairs, distinct on both surfaces, reticulate, the petiole ca. 5 mm. long, on larger leaves up to 10 mm. Flowers axillary, solitary; pedicel ca. 7 mm. long, strongly recurved, generally glabrous or glabrescent, those of the very young flowers appressed-pubescent especially at the very tip of the branchlets; bracteoles 2, opposite, quickly caducous, when present pubescent, unequal, ca. 3 × 1.5 mm. and 5 × 3 mm.; calyx-lobes 5, imbricate, densely tawny-sericeous-pubescent, subequal, 6–8 mm. long, ca. 6 mm. wide, ovate, sometimes subrotund at the apex, outer lobes thicker, glandular-denticulate along the scarious margin, the inner lobes thinner, the margin usually entire; corolla-lobes 5, connate at the base, white, pubescent on the median portion of the exterior surface, oblong-subelliptic, 7–8 mm. long, ca. 4 mm. wide, somewhat obtuse at the apex; stamens 30–35, seemingly uniseriate, rather uniform in size, 5.5–7 mm. long, the filaments 2–3 mm. long, glabrous, quite free from each other, adnate to the base of the corolla, projected at the apex into an apicule ca. 1 mm. long, the anthers ca. 3 mm. long, linear, pubescent; ovary minute, densely covered with whitish or tawny pubescence, 5-celled, multi-ovulate, tapering into a densely pubescent style 6–7 mm. long. Fruit globose, black, pubescent, 5-celled, many-seeded, 1–2 cm. diameter.

The outstanding characteristics of this species are: (1) the 5-celled ovary; (2) the dense tawny pubescence on the floral parts; (3) the distinct reticulate veining obvious on both surfaces and the dark-punctate dots on the lower surface of the leaves; (4) the short, recurved pedicel; and (5) the glandular-denticulate margin of the leaves.

Its closest relative is *A. lasiostyla* Hayata, which can be separated by the 3-celled ovary, the obscure veining, the usually entire margin, and the scattered pubescence on the lower half of the style.

Several synonyms are cited above, only one of which, *A. rubropunctata*

Merrill & Chun, needs comment. In 1940, Chun (Sunyatsenia 4: 188) listed seven specimens from Hainan as belonging to *A. rubropunctata*. Of these, I have examined *S. K. Lau 196, H. Y. Liang 61760, F. C. How 72471* and *73514*. I can find no characters in these specimens that would warrant separation from the above species. Metcalf (1932) separates *A. rubropunctata* from *A. hainanensis* on the presence of red-punctate dots on the lower surface of the leaf, and the apiculate denticulations along the margin. The original description stressed these two characters. Examining considerable material, one finds great variation in the color of the punctate dots which range from black through brown to reddish brown, even to a lighter yellowish shade. This color variation is undoubtedly due to the age of the leaf. The apiculate denticulations may be found on nearly every leaf, varying in size and number. Age probably governs this characteristic also, as these apiculations are very fragile and are easily broken off.

The type specimen of *A. rubropunctata, Tsiang 2713*, offers the only variation worthy of consideration. Whereas in most of the specimens cited above the pubescence is tawny or straw-colored, in the above-mentioned type the pubescence is more dense and ferrugineous. The pedicels of *Tsiang 2713* are densely pubescent. As it happens, all the flowers of *Tsiang 2713* are concentrated at or near the apex of the young branchlets, so near as still to possess the pubescence found on the early growing parts. In the other specimens examined the flowers are scattered along the stems, and the pedicels are usually glabrous or only slightly pubescent. In *Tsiang 2713*, the bracteoles are consistently persistent. In the other specimens of *A. hainanensis*, the bracteoles are quickly caducous, but when present, are of the same size and shape as those found on the above-mentioned Tsiang specimen.

7. **Adinandra lasiostyla** Hayata in Jour. Coll. Sci. Tokyo 30 (Art. 1): 42. 1911. — Kanehira, Formosan Trees 53, fig. 1917; revised ed. 453, fig. 410. 1936. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 145. 1925. — Sasaki, Cat. Governm. Herb. 347. 1930.

DISTRIBUTION: Formosa.

FORMOSA: Arisan, *R. Kanehira 2842* (NY, US), Dec. 1, 1933. Arisan Prov., Kagi, in forest, alt. 1600–2800 m., *E. H. Wilson 9667, 9770, 10819* (A, US), Jan. 29, Feb. 4, Oct. 18, 1918 (tree 10–15 m. high).

Trees 8–15 m. high, 1–1.5 m. circumference; branches terete, brown to grayish brown, the branchlets and terminal buds tawny-pubescent. Leaves coriaceous, oblong-elliptic, 8–13 cm. long 2–4 cm. wide, acuminate at the apex, acute at the base, shining glabrous above, pubescent beneath, the margin entire or obscurely crenulate, the veins ca. 12 pairs, obscure above, somewhat conspicuous beneath, the petiole short, 3–5 mm. long, pubescent beneath. Flowers axillary, solitary; pedicels pubescent, short, recurved, ca. 5 mm. long; bracteoles 2, quickly caducous; calyx-lobes 5, imbricate, subequal, rounded, ca. 6 mm. long, 5 mm. wide, pubescent, glandular-denticulate along the margin; corolla-lobes 5, lightly connate at the base, ca. 9 mm. long, 5 mm. wide, broadly acute or obtuse at the apex, pubescent along the median portion of the exterior surface; stamens 20–25,

seemingly uniseriate, rather uniform in size, 5–5.5 mm. long, the filaments glabrous, 1.5–2 mm. long, quite free from each other but adnate to the base of the corolla, the anthers ca. 2.5 mm. long with dense tawny pubescence, the apicule distinct 1–1.5 mm. long; ovary subglobose, tapering slightly at the apex, scattered pubescent, 3-celled, multi-ovulate; style entire, up to 10 mm. long, 1–1.5 mm. in diameter near the base, sparingly pubescent along the lower half; stigma obtuse. Fruit immature.

This species is closely related to *A. Millettii* (Hooker & Arnott) Benth. & Hook. f. and perhaps belongs to the same alliance of species. Certain consistently uniform characteristics, however, are present to warrant specific separation. The large pubescent acuminate leaves resemble those of *A. Bockiana* Pritzel and its variety *acutifolia* (Hand.-Mazz.) Kob.

A dense pubescence covers the young branchlets, lower leaf-surface, pedicels and calyx-lobes. Oddly enough, the style (whence the specific name) is only slightly pubescent with the scattered pubescence extending only along the lower half.

The pedicel is very brief, not more than 5 mm. long, and always recurved. The calyx-lobes are rounded rather than acute and the exterior surface of the corolla-lobes is pubescent.

Whereas *A. Millettii* is considered a shrub and rarely a small tree, this species is definitely a tree of considerable magnitude according to Wilson, measuring "30–50 ft. × 2–5 ft." I presume the latter measure is circumference. Wilson states that the species is very common at Arisan. All specimens examined by the author were collected from this locality or nearby Mt. Morrison. All other specimens cited in literature have been collected in the same general limited locality.

8. **Adinandra epunctata** Merrill & Chun ex Tanaka & Odashima in Jour. Soc. Trop. Agric. 10: 374. 1931, nomen; Merrill & Chun in Sunyatsenia 5: 132, fig. 14. 1940.

DISTRIBUTION: China (Hainan).

HAINAN: Mo San Leng, in forest, alt. 1300 m., *N. K. Chun & C. L. Tso 44289* (A, C, NY, US), Nov. 20, 1932 (tree 12 m. high with grayish brown bark and gray branchlets; leaves deep lustrous green; flowers white). — In mixed forest, *C. Wang 35912* (TYPE A, ISOTYPES NY, US), Dec. 18, 1933 (tree 18 m. high with gray branches; leaves green above, paler green and tomentose beneath; flowers yellowish white). — In mixed forest, *C. Wang 36007* (A, NY, US), Dec. 30, 1933 (tree 12 m. high with white flowers). — In shaded forest on mountain side, *H. Y. Liang 64384* (NY), Jan. 10, 1934 (tree 12 m. high, 1 m. diam.; leaves thick, green above, paler beneath).

Small tree 12–18 m. high; branches terete, glabrous, gray or brown-gray, the branchlets terete, gray or gray-brown, finely appressed-pale- to ferrugineous-pubescent, the terminal buds conical, covered with a very dense tawny to ferrugineous velvety pilose pubescence. Leaves coriaceous, elliptic-oblong, 5–11 cm. long, 2–4 cm. wide, acute at both the apex and the base, lustrous, deep green, glabrous above, paler, at first densely appressed-pubescent beneath, later glabrescent or nearly so, entire along the margin, the veins 12–15 pairs, arching upward near the margin, quite prominent above, less so beneath, the petiole 8–15 mm. long, appressed-pubescent. Flowers axillary, solitary, occasionally in twos; pedicels up to 7 mm. long, densely pubescent, usually somewhat recurved; bracteoles 2, opposite, persistent, sepaloid, long-triangular, ca. 3 mm. long, 1.75–2

mm. wide, acute at the apex, densely pubescent; calyx-lobes 5, imbricate, ovate, acute at the apex, ca. 5 mm. long, 2.5–3 mm. wide, entire, densely appressed-pale-pubescent; corolla-lobes 5, white, lightly connate at the base, oblong, obtuse at the apex, 6 7 mm. long, 3–4 mm. wide, pubescent on the external surface, glabrous within; stamens 25, unequal, 4–6 mm. long (in the same flower), the filaments 2–4 mm. long, pubescent on the external surface except at the base where joined to the corolla, for the same distance joined to each other, the anthers lanceolate, nearly equal, 1.5–2.0 mm. long, pubescent; the apicule short, 0.5 mm. or less; ovary somewhat conic-ovoid, densely gray-pubescent, 3-celled, tapering at the apex into an entire, pubescent style ca. 3–4 mm. long. Fruit small, ovoid, ca. 5 mm. long, 4 mm. diam., densely pubescent, 3-celled, few-seeded, seeds 9–10, brown, scrobicular, ca. 2 mm. long.

A few of the outstanding characteristics of this species are the small flowers and fruit, the persistent and comparatively large bracteoles, the very short pedicels, the pubescent filaments of the anthers, the entire leaves, and the small number of seeds developing in the fruit.

Although not described until 1940, this species was mentioned in a list of the Hainan plants by Tanaka and Odashima in 1931, the name probably recorded from an herbarium sheet.

Merrill and Chun, in their description, do not mention the number of cells in the ovary and fruit but in the accompanying illustration the ovary is pictured as six-celled. Because of the minute size and dense pubescence, dissections of the ovary are very difficult and quite unsatisfactory. On the other hand, the fruit, when mature, is so crowded with the few seeds which are normal in size, even though the fruit is small, that dissections again are rather unsatisfactory. After several dissections, none of which showed clear-cut cell-structure, my conclusions are that the fruit is three-celled rather than six-celled. It may be that in the original drawing the placentae, which often extend nearly across the cell, were mistaken for cell-walls.

9. **Adinandra laotica** Gagnepain in Not. Syst. Mus. Hist. Nat. Paris 10: 114. 1942; in Fl. Gén. Indo-Chine, Suppl. 1: 283. 1943.

DISTRIBUTION: Indo-China (Laos).

LAOS: Hui-Muang Ao, Xieng-khuang, by stream among evergreens, alt. up to 1100 m., *A. F. G. Kerr 21172* (ISOTYPE, K), April 21, 1932 (tree 15 m. high).

Tree 15 m. high; branchlets tawny brown, terete, glabrous; terminal buds large, glabrous. Leaves thick-coriaceous, glabrous, oblong-lanceolate, 15–20 cm. long, 5.5–6.5 cm. wide, shortly acuminate at the apex, tapering at the base, the margin entire, lightly revolute, the primary veins 12–15 pairs, anastomosing and arching upward near the margin, somewhat pronounced above, obscure beneath, frequent secondary veins interspersed between the primary veins, the petiole 15–20 mm. long, glabrous. Flowers axillary, in pairs; pedicel 2–2.5 cm. long, glabrous, thickening towards the apex; bracteoles 2, opposite or nearly so, quickly caducous; calyx-lobes 5, imbricate, broadly ovate, ca. 8 mm. long, 6–7 mm. wide, glabrous, the margin ciliolate; corolla-lobes (in bud) 5, connate at the base, ca. 6 mm. long, glabrous; stamens (bud) ca. 25, 3?-seriate, 2–6 mm. long, the filaments

glabrous, the anthers pilose; ovary glabrous, quite flat in bud, 5-celled, multi-ovulate, the style entire, glabrous.

Adinandra laotica is in many respects a very close relative of *A. angulata* Ridley. Both species have thick branches and branchlets, terete in the former and decidedly angled in the latter. The leaves of both are stiff and heavy-coriaceous. The flowers are axillary and in pairs. In *A. angulata* the two pedicels remain attached at the base when removed from the stem and it appears that such may be the case in *A. laotica*. Both species are very glabrous, even to the terminal bud.

In *A. angulata*, the ovary and fruit are 3-celled with few ovules and later with only a few large seeds developing. Gagnepain describes the ovary of *A. laotica* as 4-celled. My single dissection showed the ovary to be clearly 5-celled. Only buds were available to both Gagnepain and myself, and in the bud, the ovary is very flat, thin and difficult to section. The bracteoles of *A. laotica* are caducous while in *A. angulata* they are persistent. Also, the veins of the leaves of *A. angulata* are less in number and much more prominent.

10. **Adinandra nitida** Merrill ex Li in Jour. Arnold Arb. **25**: 422. 1944.

DISTRIBUTION: China (Kwangsi, Kwangtung).

KWANGSI: Shang-sze Distr., Shap Man Taai Shan, near Iu Shan village, southeast of Shang-sze, near the Kwangtung border, in dry sandy thickets, *W. T. Tsang 22322* (TYPE, A), May 18, 1933 (4 m. high; flowers fragrant, white). — Shang-sze Distr., Shap Man Taai Shan, near Hoh Lung village, southeast of Shang-sze, near Kwangtung border, in thickets on dry steep rocky slope, *W. T. Tsang 22571* (A), June 26, 1933 (fruit black). — Shang-sze Distr., Shap Man Taai Shan, Tang Lung village, southeast of Shang-sze, near Kwangtung border, *W. T. Tsang 24431* (A, NY), Oct. 1934 (scattered shrubs 2 m. high; fruit yellow, edible). — N. Luchen, Chu Feng Shan, 30 li southwest of Shan Feng, in forest, alt. 800 m., *R. C. Ching 5826* (NY), June 8, 1928 (tree 15 m. high, 30 cm. diam., with gray bark). — Kan-tung, Miu Shan, in forest, alt. 1000 m., *R. C. Ching 6139* (NY), June 18, 1928 (tree 10 m. high, 15 cm. diam., with gray bark; leaves glossy green above, paler beneath; flowers creamy white, scented, nodding). — N. Luchen, In-tung, Miu Shan, near border of Kweichow, in woods, alt. 1000 m., *R. C. Ching 6238* (NY), June 21, 1928 (shrub 6 m. high, 15 cm. diam.; leaves glossy dark green above, paler beneath; flowers creamy white, nodding). — South of Nanning, *R. C. Ching 8431* (NY), Nov. 5, 1928 (tree 20 m. high). — Yao Shan, along stream in mixed woods, *C. Wang 39215* (A), *40030* (A), May-Oct. 1936. — Tseungyuen, Yao Shan, along stream, *C. Wang 39413* (A), June 18, 1936 (small tree with white flowers). KWANGTUNG: Hwei-yang Distr., Ling Fa Shan, Lin Fung Monastery, *W. T. Tsang 25656* (A), Aug. 11–31, 1935 (tree 7 m. high; fruit black, edible).

Shrub or small tree up to 20 m. high; branches terete, glabrous, gray-brown, the branchlets usually purplish brown, terete, glabrous, the terminal bud obscurely appressed-pubescent near the apex, otherwise glabrous. Leaves coriaceous, ovate-oblong, 7–12 cm. long, 2.5–4 cm. wide, acuminate or obtusely acuminate at the apex, acute at the base, glabrous on both surfaces, dark glossy green above, paler beneath, the margin serrulate, varying in degree, the veins 12–16 pairs, somewhat conspicuous on both surfaces, the petiole glabrous, 1–1.5 cm. long. Flowers axillary, solitary; pedicel 1–2 cm. long, glabrous; bracteoles 2, persistent, opposite, unequal, subsepaloid, glabrous, 9–11 mm. long, 4–5 mm. wide, ovate, acute at the

apex, the smaller bracteole usually keeled along the center of the external surface; calyx-lobes 5, imbricate, glabrous, unequal, ovate, ca. 15 mm. long, 7–9.5 mm. wide, sharply acute at the apex, often subapiculate; corolla-lobes 5, connate at the base, glabrous, unequal, 17–19 mm. long, 9–12 mm. wide, obtuse to rounded at the apex; stamens ca. 25, unequal, 6–11 mm. long, the filaments joined at the base, adnate to the base of the corolla, glabrous, 2–5 mm. long (in the same flower), the anthers linear, 4–6 mm. long, hirsute on the exterior surface; ovary glabrous, ovoid, ca. 4 mm. diam., 3-celled, multi-ovulate, tapering into the glabrous style 10 mm. long, the style 3-parted at the apex for as much as 3 mm. Fruit globose, ca. 1.5 cm. in diameter.

Adinandra nitida, as the name signifies, is characterized by dark green leaves, extremely lustrous on the upper surface and drying to a dark brown or near black. The whole plant, except for a slight and almost unnoticeable pubescence on the terminal bud and anthers, is glabrous, an unusual feature in the genus. Large flowers and flowering parts, including the persistent almost sepaloid bracteoles, are features of distinction. The style, glabrous and three-parted up to 3 mm. is still another character of note.

Except for a single specimen, *Tsang 25656* from Kwangtung, the species seems to be confined to the province of Kwangsi. However, since several specimens were collected on or near the Kwangtung border, one may expect to find this species in future Kwangtung collections.

11. **Adinandra Howii** Merrill & Chun in Sunyatsenia 5: 131. 1940.

DISTRIBUTION: China (Hainan).

HAINAN: Po-ting Distr., Hing Lung, Sheon-Kai-Na, in forest, alt. 800 m., *F. C. Howe 73559* (TYPE, A), Aug. 30, 1935 (tree 7 m. high with brownish red bark; leaves lustrous green above, pale green beneath; stamens pure yellow).

Small tree, 7 m. high; branches terete, glabrous, brownish red, the branchlets terete, grayish brown, glabrous except for a very fine appressed pubescence at the extreme tip of the new growth, the terminal bud densely sericeous. Leaves coriaceous, oblong-elliptic, 6–11 cm. long, 2.5–4 cm. wide, acuminate at the apex, tapering at the base, lustrous green, glabrous above, paler green, glabrous beneath, the margin serrulate, minutely glandular-apiculate, the veins 15 20 pairs, barely conspicuous on both surfaces, the petiole short, 3–5 mm. long, glabrous. Flowers not seen. Fruit axillary, solitary; pedicel glabrous, 1.5–2 cm. long; bracteoles 2, caducous, alternate; fruiting calyx-lobes 5, imbricate, glabrous, broadly ovate, ca. 8 mm. long, 5 mm. wide, the outer lobes larger with the margins entire, the inner lobes often glandular-margined. Fruit ovoid, glabrous, ca. 1 cm. diam., 3-celled, many-seeded; the placentae extending nearly completely across the cell giving the appearance of six cells; style glabrous, entire, ca. 7 mm. long.

Except for the terminal buds and the current year's growth of branchlets, this species is entirely glabrous. Its closest relative is *A. hainanensis* Hayata, and it might be considered a glabrous variety of this species were it not for the three-celled ovary. The type specimen, the only specimen examined in this study, was gathered in the immature fruiting stage, hence

a description of flowers or mature fruit must wait for further collections.

12. **Adinandra ryukyuensis** Masamune in Trans. Nat. Hist. Soc. Formosa 24: 210. 1934.

DISTRIBUTION: Liu Kiu Islands.

NO SPECIMENS EXAMINED:

Tree?; branches brown, the branchlets appressed-pilose at the ends, the buds densely ferrugineous-pubescent. Leaves coriaceous, obovate, obovate-elliptic or elliptic, 3–6 cm. long, 1–2 cm. wide, acuminate at the apex, cuneate at the base, glabrous above, ferrugineous-pubescent beneath, the margin entire, the petiole short, hirsute. Flowers axillary, solitary; pedicel ca. 2 cm. long, recurved, ferrugineous-pubescent; bracteoles 2, deltoid-lanceolate; fruiting calyx-lobes 5, imbricate, ovate, ca. 10 mm. long, 6 mm. wide, acuminate at the apex, sericeous-pubescent. Fruit glabrous.

Adinandra ryukyuensis and *A. Zen-Tasiroi,* the following species, must be linked together in this treatment. Both are from the Liu Kiu Island chain and may be identical. Translated descriptions are given here in an attempt to bring together as complete knowledge of the genus as possible. Although the description of the former is very incomplete, one cannot help but be impressed by the very close similarity between the two, even though varying terms have been used. Both have persistent bracteoles. In *A. ryukyuensis* the size is lacking and in *A. Zen-Tasiroi* the shape is not recorded. The calyx-lobes are almost identical in size, shape and pubescence. The fruit in both species is glabrous, a character which separates these two species from most others within their geographical range. In both species, the corolla and stamens are undescribed.

13. **Adinandra Zen-Tasiroi** Hatusima in Jour. Jap. Bot. 15: 133, 138, fig. 2. 1939.
"*Adinandra Millettii* Bentham et Hooker f. sensu Maximowicz in Mél. Biol. 12 (1886) 421, pro parte (plantas ex insl. Amami-ohsima). — Ito et Matumura, Tent, Fl. Lutch. 1 (1899) 324, pro parte. — Hayata, Icon. Pl. Formos. 2 (1911) 852. — Yamamoto et Mori in Sylvia 5 (1934) 31, pl. 1, fig. 4."
"*Adinandra Millettii* var. Matumura et Hayata, Enum. Pl. Formos. (1906) 45."

DISTRIBUTION: Liu Kiu Islands.

NO SPECIMENS EXAMINED:

Trees; branches brown-gray, subglabrous, the branchlets slender, densely appressed gray-hirsute. Leaves alternate, subcoriaceous, shortly petiolate, oblong-lanceolate, oblong or lanceolate, long-acuminate at the apex, cuneate at the base, 5–8 cm. long, 1.5–2 cm. wide, shining glabrous above, appressed-hirsute beneath, the margin entire or obscurely crenulate, the petiole 3–6 mm. long, densely hirsute. Flowers axillary, solitary; pedicels 1.5–2.2 cm. long, densely hirsute; bracteoles 2, opposite, immediately below the calyx-lobes, ca. 8 mm. long, 2 mm. wide, hirsute; calyx-lobes 5, imbricate, oblong-ovate or narrowly ovate-triangular, ca. 1 cm. long, 5 mm. wide, acuminate at the apex, appressed gray-villous; petals and stamens unknown; ovary glabrous, the style glabrous, ca. 6 mm. long.

A discussion of the close relationship between *A. Zen-Tasiroi* and the preceding species, *A. ryukyuensis* Masamune may be found under the latter named entity. *Adinandra Zen-Tasiroi* has the more complete description.

According to the synonymy as recorded by Hatusima, this species has

been examined by several workers (Maximowicz, Ito and Matsumura, Hayata, and Yamamoto and Mori) and erroneously placed under *A. Millettii*. This synonymy is quoted above merely for a record.

14. **Adinandra yaeyamensis** Ohwi in Act. Phytotax. Geobot. 7: 136. 1938.

DISTRIBUTION: Liu Kiu Islands.

"Riukiu Isl. Iriomote Isl. (*G. Koidzumi* — type in Herb. Imper. Univ., Kyoto). — Same island, (*G. Koidzumi; S. Sonohara*). — Iriomote Isl., (*G. Koidzumi*)."

Branches and branchlets terete, dark brown, the current year's branchlets terete, ascending, densely gray-brown-pilose. Leaves coriaceous, narrow oblong to narrow obovate, 5–10 cm. long, 2–3 cm. wide, glabrous, shining dark green above, paler, pilose at first beneath, later subglabrescent, obtuse at the apex, contracted or abruptly narrowed at the base, the margin lightly serrate, the veins somewhat conspicuous beneath, the midrib and petiole (4–5 mm. long) pubescent. Flowers axillary, solitary; pedicel slender, terete, 1.5–3 cm. long, recurved, pilose; bracteoles 2, at the apex of the pedicel, caducous; calyx-lobes 5, broadly elliptic or subrotund, 3–5 mm. long, finally up to 7 mm. long, very obtuse at the apex, sparsely pilose on the external surface, ciliolate along the margin; ovary globose, sparsely long-pilose, the style ca. 10 mm. long, narrowed from the base, glabrous or nearly so, the seeds shining, ca. 1.5 mm. long, dark brown, punctulate.

This species, like the others from the Liu Kiu chain of islands, is little known. No material was available for this study. The above description is merely a literal translation of Ohwi's Latin and, along with the citation of specimens, is included here in order to bring together in one place all the literature of the genus to date.

Ohwi states that the species can be separated from *A. Millettii* var. *formosana* (Hayata) Kob. by the longer pubescence, hardly appressed, the calyx-lobes obtuse at the apex, and the style, for the most part glabrous.

15. **Adinandra obtusissima** Hayata in Sasaki, Cat. Governm. Herb. 347, 1930, nom. nud. — Y. Yamamoto in Jour. Soc. Trop. Agric. 5: 347, fig. 9. 1933. — Kanehira, Formosan Trees, revised ed. 453, fig. 411. 1936.

DISTRIBUTION: Formosa.

NO SPECIMENS EXAMINED:

Branches and branchlets brown-gray, the branchlets of the current year pubescent. Leaves alternate, petiolate, obovate, 4–7 cm. long, 2–3.5 cm. wide, very obtuse, rounded or mucronate at the apex, rarely retuse, cuneate or acute at the base, the margin entire or rarely lightly serrate near the apex, in the dried state strongly revolute, shining green above, pale, minutely pubescent beneath, the midrib sulcate above, prominent, minutely pubescent beneath, the primary nerves 10–12 pairs, elevated on both surfaces, extending from the midrib at an angle of 60°–70°, the petiole 5–7 mm. long, sulcate above, pubescent beneath. Fruit axillary, solitary, the pedicel slender, 2.5 cm. long, glabrous, swollen at the apex. Sepals 5, subequal, ovate, 8 mm. long, 5 mm. wide, obtuse at the apex, pubescent on the external surface. Fruit globose, ca. 11–12 mm. diam., sericeous-pubescent, 3-celled, the style persistent, 12 mm. long.

Originally, in 1930, the name *Adinandra obtusissima* was listed as a nomen nudum by Sasaki, and attributed to Hayata. Later, in 1933,

Yamamoto gave a detailed description. He states that the leaves are very obtuse or rounded at the apex, 4–7 cm. long, 2–3.5 cm. wide, pubescent on the under surface. Both by Yamamoto and Kanehira the leaves are illustrated as nearly rotund at the apex and rather broad. The calyx-lobes are subequal, ovate, 8 mm. long, 5 mm. wide, obtuse at the apex, and pubescent. The pedicel is listed as 2.5 cm. long. The fruit is described as globose, 3-celled, ca. 11–12 mm. in diameter, sericeous-pubescent with a persistent style 12 mm. long. Although not mentioned in the description, evidence of pubescence on the style is depicted in the illustrations.

Only three specimens of this species have been cited in literature, all of them collected by Matuda. The localities of collection are in southern Formosa near South Cape. They are Ariko-banti, Ako, *Matuda 25443* and Mt. Daizyurin, Takao, *Matuda 15544, 25545*.

I feel that this species is probably merely a variety of *A. Millettii* and may possibly be the same as *A. Millettii* var. *obtusissima* Kob., but since no opportunity has been available to compare the two entities, it is best to retain the specific status, even though dubious at the present time.

Material for the following three species recently published by Gagnepain has not been available for this study. Except for the added citations of literature the descriptions are quoted as originally published.

16. **Adinandra annamensis** Gagnep., n. sp. [in Not. Syst. Mus. Hist. Nat. Paris 10: 112. 1942; in Fl. Gén. Indo-Chine, Suppl. 1: 285. 1943].

Arbor ± 12–15 m. alta. Ramuli floriferi 2 mm. crassi, pilosi, pilis rufis, appressis, dein glabrescentes. Folia oblongo-lanceolata, breviter acuminata, obtusiuscula, basi cuneata, infra pilosa, pilis appressis, supra viridiora glaberrima, 5–8.5 cm. longa, 2–3.5 lata, tenuia, firma, infra punctis sparsis notata, margine tenuiter serrata; nervi secundarii 12 in utroque latere, subtus magis conspicui, cum intermedio vix prominente; venulae reticulatim dispositae, ad marginem conspicuores; petiolus 3–5 mm. longus, rufo pilosus, pilis appressis. Inflorescentiae pedicelli axillares, solitarii, arcuato-dependentes, dense et appresso-pilosi, ante anthesin 8–10 mm. longi; alabastra globosa, 8 mm. diam.; bracteae e calyce haud remotae, caducae, 4 mm. longae. — Sepala ovato-triangula, ± 6 mm. longa lataque, dorso appresso-pilosa. Petala (haud evoluta) 5 mm. longa, dorso late sericeo. Staminum antherae connectivo acuminatae, dorso ventreque sericeae. Ovarium dense piloso-sericeum; stylus sericeus, apice glabro, latitudine ovarii ⅓ longior. Fructus. . . .

Annam: Dent du Tigre, prov. Quang-tri, n° 10.382 (*Poilane*). Tonkin: réserve forestière de Phong-du, prov. Tien-yen (*A. Chevalier*).

Cette espèce à ovaire velu, à style 2–3 fois plus long que l'ovaire se place auprès de *A. rubropunctata* Merrill et Chun. Elle en diffère principalement: 1° par le connectif des étamines velu; 2° par le filet glabre.

17. **Adinandra caudata** Gagnep., n. sp. [in Not. Syst. Mus. Hist. Nat. Paris 10: 112. 1942; in Fl. Gén. Indo-Chine, Suppl. 1: 288. 1943].

Arbor elata, trunco 15 m. alto, cortice laevi rubescensque. Ramuli floriferi 2–3 mm. crassi, sericei mox glabri. Folia lanceolata, apice acuminato-caudata, basi cuneata, 8–17 cm. longa, 3–5 lata, supra glabra

viridiaque, infra pilosa, pilis brevibus appressis, margine tenuiter serrata; nervi secundarii 7–8 utrinque, cum intermedio subaequale; venulae retem laxum margine magis conspicuum efformantes; petiolus 7–12 mm. longus, piloso-sericeus, dein glabrescens. Inflorescentiae pedicelli axillares, 25–27 mm. post anthesin longi, ad calycem gradatim incrassati, pilosi, pilis appressis; bracteae mox caducae vel nullae. — Sepala 5, appresso-pilosa, ovato-triangula, 1.5 mm. longa lataque, intus glabra. Petala . . . Stamina . . . Ovarium post anthesin subglobosum, sericeo-pilosum, 1.5 mm. latum, 1.2 altum, stylo apiculatum; stylus columnaris, acuminatus, integer, 1.2 mm. longus, sericeus; semina immatura brunnea, nitida, tenuissime granulata, lenticulari-polyedra, 1.5–2 mm. diam.; embryo semiorbiculari.

ANNAM: Dàk-kiêt, prov. Thanh-hoa, n° 1.840 (*Poilane*); Nui Bach-ma, près Hué, n° 29.828 (*Poilane*); Nhatrang, n° 4.286 (*Poilane*).

Ici les pétales, les étamines sont inconnus. Bien que les caractères importants fournis par ces organes manquent, nous croyons que cette espèce pourra assez facilement être distinguée de tout autre.

18. **Adinandra donnaiensis** Gagnep., n. sp. [in Not. Syst. Mus. Hist. Nat. Paris 10: 113. 1942; in Fl. Gén. Indo-Chine, Suppl. 1: 283. 1943].

Arbor 8–15 m. alta, trunco 15–25 cm. crasso. Ramuli floriferi 1–1.5 mm. diam., glaberrimi, grisei. Folia lanceolata, basi cuneata, apice acuminato-obtusiuscula, 6–10 cm. longa, 2.5–3 lata, utrinque glabra, margine leviter serrata; nervi secundarii 8–10 utroque latere, ad marginem arcuati, confluentesque; venulae tenues, reticulatim dispositae; petiolus gracilis, 7 mm. longus, glaber, supra canaliculatus. Inflorescentia ad ramulos 1–2-ennos inserta; pedicelli axillares, solitarii vel geminati vel terni, graciles, 1.5 mm. longi, ad apicem gradatim incrassati; alabastra conica, 9–10 mm. longa; bracteae oppositae, e calyce vix remotae, ovato-obtusae, 2–5 mm. longae, ciliolatae. — Sepala 5, reniformia, ± 2 mm. longa, 3–4 mm. lata, margine ciliolata, supra sericea. Petala 5, triangula, 8 mm. longa, supra basin 5 mm. lata, glaberrima. Stamina numerosa; filamento plano, brevi (1.5 mm.), breviter piloso; anthera triangulo-mucronata, 3 mm. longa, mucrone 1 mm. longo incluso; loculi praesertim ad marginem sericei. Ovarium globoso-depressum, 3–5 mm. latum, glaberrimum; stylus longe conicus, 4–5 mm. longus, glaberrimus; loculi 3, pluriovulati, placentariis ad parietes radiantibus. Fructus immaturus globosus, glaber, 7–8 mm. diam., maturus niger (Poilane).

ANNAM: massif du Bi-doup, prov. Haut-Donnai, n°s 30.724 et 30.848 (*Poilane*). CAMBODGE: Pu-chom, prov. Kompongchnang, n° 28.793 (*Poilane*).

Diffère de *A. laotica* Gagnep.: 1° ramules plus grêles; 2° feuilles 2 fois plus courtes et étroites; 3° marge du limbe denticulée et veinules visibles; 4° pédicelles un tiers plus courts; 5° bractées opposées; 6° sépales réniformes; 7° connectif des anthères égalant la moitié des loges, glabre.

DOUBTFUL SPECIES

19. **Adinandra kweichovensis** Hu in Bull. Fan. Mem. Inst. Biol. 8: 145. 1938.

Although no material of the species has been available for this study, I feel very dubious of its placement in the genus *Adinandra*. The description of the species leads one to believe that it belongs to the genus *Cleyera*.

Hu states in his description, "arbor ad 4 m. alta, omnino glabra; folia . . . margine integra leviter revolutaque . . . petioli robusti . . . 1.5 cm. longi; . . . fructi 1–3, . . . sepala 5 ovata 5 mm. longa, marginibus ciliata; stylus tenuis 5 mm. longus; bacca globosa 8 mm. diametro; semina pauca, magna compressa . . . 3 mm. longa, 2.5 mm. lata."

The completely glabrous plant, the entire margin of the leaves, the petiole, robust and 1.5 cm. long, the margin of the sepals ciliate, the globose fruit 8 mm. in diameter and finally the few seeds are all features of *Cleyera japonica* Thunb. The only variations, in my opinion, are the sepals (5 mm. long) and the style (5 mm. long). In *Cleyera* the sepals are seldom longer than 3 mm. and rounded and the style is usually, not always, two- or three-parted.

EXCLUDED SPECIES

Adinandra bracteata Li in Jour. Arnold Arb. 26: 65. 1945 = **Ternstroemia ? insignis** Wu in Bot. Jahrb. 71: 195. 1940.

Although no flowers or fruit remain on the specimen, *Wang 39626*, designated by Li as the type of *A. bracteata*, from the fragments of his dissection showing the many glabrous stamens arranged in series, the leaf-buds, and the sub- or pseudo-verticillate arrangement of leaves and branchlets, there seems little doubt that the species does not belong to the genus *Adinandra*, but probably to *Ternstroemia*.

There is a close relationship between Li's species and *Ternstroemia insignis* Wu, collected at the same locality Lao Shan in Kwangsi. However, from the descriptions there can be no certainty that they are identical. There is variation in leaf-size and stamen measurements. Li stated that the stamens of *A. bracteata* were "1.1–1.3 cm." long. The fragments of his dissections show stamens measuring 5–6 mm. in length, which compare favorably with those (5 mm. long) found in *T. insignis*. However, these stamens may have been taken from an unopened flower-bud, since the filaments appear very short and undeveloped.

Adinandra Chingii Metcalf in Lingnan Sci. Jour. 11: 19. 1932 = **Cleyera japonica** Thunberg emend. Sieb. & Zucc. Fl. Jap. 153. 1941.

Adinandra obscurinervia Merrill & Chun in Sunyatsenia 2: 283, fig. 35. 1935 = **Cleyera japonica** Thunberg emend. Sieb. & Zucc. var. **lipingensis** (Handel-Mazzetti) Kobuski in Jour. Arnold Arb. 18: 127. 1937.

Adinandra stenosepala Hu in Bull. Fan. Mem. Inst. Bot. Ser. 8: 146. 1938 = **Sideroxylon** (Planchonella) **stenosepala** Hu in Bull. Fan. Mem. Inst. Biol. Ser. 10: 129. 1940.

PHILIPPINE SPECIES

Fifteen species have been described from the Philippine Islands under the genus *Adinandra*. The present study recognizes eight. Of these eight species six have been described by Merrill and one each by A. D. E. Elmer and C. B. Robinson. Three of the earlier described species have been transferred to other genera: *A. coriacea* Elmer to *Ternstroemia gymnanthera*

(W. & A.) Sprague, *A. urdanetensis* Elmer to *T. urdanetensis* (Elmer) Kobuski, and *A. montana* Merrill to *Cleyera japonica* Thunb. var. *montana* (Merrill) Kobuski. This last-named variety is the first representative of the genus *Cleyera* in the Philippine Islands.

The Philippine species of *Adinandra* form a distinct group among themselves. Their relationships are more clearly with the Eastern Asiatic species than with the Indo-Malaysian group.

Below are listed the characters helpful in specific identification. Under these characters are recorded the species as far as present-day knowledge permits.

CHART FOR PHILIPPINE SPECIES OF ADINANDRA

Bracteoles

PERSISTENT	CADUCOUS
apoensis	*elliptica*
leytensis	*luzonica*
Loheri	*Macgregorii*
nigro-punctata	*maquilingensis*

Calyx-lobes

PUBESCENT	GLABROUS
elliptica	*apoensis*
leytensis	*Loheri*
luzonica	*Macgregorii*
maquilingensis	*nigro-punctata*

Corolla-lobes

PUBESCENT	GLABROUS
apoensis *elliptica* *leytensis* *Loheri* *luzonica* *Macgregorii* *maquilingensis* *nigro-punctata*	None

Filaments

PUBESCENT	GLABROUS
apoensis *leytensis* *luzonica* *nigro-punctata*	*elliptica* *Loheri* *Macgregorii* *maquilingensis*

Ovary

PUBESCENT	GLABROUS
elliptica *luzonica* *Macgregorii* *maquilingensis*	*apoensis* *leytensis* *Loheri* *nigro-punctata*

Style

PUBESCENT	GLABROUS
maquilingensis	*apoensis* *elliptica* *leytensis* *Loheri* *luzonica* *Macgregorii* *nigro-punctata*

Ovary

THREE-CELLED	FIVE-CELLED
elliptica *leytensis* *Loheri* *Macgregorii* *maquilingensis*	*apoensis* *luzonica* *nigro-punctata*

KEY TO THE PHILIPPINE SPECIES

A. Ovary and fruit pubescent; bracteoles caducous.
  B. Ovary and fruit 5-celled; calyx-lobes, ovary and fruit covered with a dense canescent pubescence; filaments pubescent; leaves conspicuously reticulate-veined on the under surface.....20. *A. luzonica.*
  BB. Ovary and fruit usually 3-celled (rarely 4-celled); pubescence when present straggling or appressed, not canescent; filaments glabrous; leaves not conspicuously reticulate-veined on the under surface.
    C. Leaves membranaceous or submembranaceous, narrowly elliptic, the apex long, tapering; pedicels distinctly slender, up to 3.5 cm. long; style always entire, glabrous.....21. *A. elliptica.*
    CC. Leaves coriaceous; pedicels robust, seldom over 2–2.5 cm. long; style entire with a tendency to separate at the apex, or divided.
      D. Style straggling-pubescent, at least the lower half; bracteoles caducous (when present broadly ovate, ca. 2 × 2 mm.); calyx-lobes broadly ovate ca. 10 × 7 mm.....22. *A. Macgregorii.*
      DD. Style glabrous; bracteoles caducous (when present oblong-obovate ca. 6 × 3 mm.); calyx-lobes narrow-ovate ca. 8 × 4.5 mm.....23. *A. maquilingensis*

AA. Ovary and fruit glabrous; bracteoles persistent.
  B. Ovary and fruit 3-celled.
    C. Ovules and seeds few; seeds up to 5 mm. long, flat, seldom more than 20 maturing.....24. *A. Loheri.*
    CC. Ovules and seeds many; seeds seldom over 2 mm. long, flat, many maturing (often more than 100).....25. *A. leytensis.*
  BB. Ovary and fruit 5-celled.
    C. Bracteoles rounded, ca. 3 × 3–4 mm.; ovary ovoid or conical, tapering into the style; stamens ca. 50.....26. *A. nigro-punctata.*
    CC. Bracteoles smaller, broader than long, 1.5–2 × 2.5–3 mm.; ovary distinctly globose, quite flattened at the apex with the style rising abruptly; stamens ca. 35.....27. *A. apoensis.*

20. **Adinandra luzonica** Merrill in Philipp. Govt. Lab. Bur. Bull. **29**: 29. 1905; in Philipp. Jour. Sci. 1 (Suppl.): 95. 1906; Enum. Philipp. Fl. Plts. **3**: 73. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 144. 1925.

DISTRIBUTION: Luzon (Bataan, Bontoc, Tayabas, Zambales), Negros (Negros Oriental).

LUZON: Bataan: **Lamao River, Mt. Mariveles, *T. E. Borden*** [P.B.F.] *1360* (NY, US), July 1904. — Lamao River, Mt. Mariveles, on exposed windswept ridges, alt. 1200 m., ***H. N. Whitford 446*** (ISOTYPES C, NY, US), July 21, 1904. — Lamao River, Mt. Mariveles, ***H. N. Whitford 1184*** (ISO-PARATYPES, NY, US), March 1905. — Mt. Mariveles, ***A. D. E. Elmer 6906*** (NY), Nov. 1904. Bontoc: Mt. Pukis, ***M. Ramos & G. Edaño*** [P.B.S.] *37819* (A), March 1920. Tayabas: Mt. Dingalan, ***M. Ramos & G. Edaño*** [P.B.S.] *26630* (A, NY, US), Aug.-Sept. 1916. Zambales: ***H. M. Curran & M. L. Merritt*** [P.B.S.] *8255* (NY, US). NEGROS: Prov. Negros Oriental, Dumaguete, Mt. Cuernos, ***A. D. E. Elmer 9812*** (A, C, M, NY, US), April 1908.

Tree up to 15 m. high, branching near the top; branches numerous, suberect, giving bushy appearance, the branchlets grayish brown, glabrous, striate, the very young branchlets, terminal bud, and very young leaves densely canescent. Leaves coriaceous, oblong-elliptic, 7–12 cm. long, 2.5–5 cm. wide, acute, occasionally somewhat acuminate at the apex, cuneate at the base, usually glabrous on both surfaces, occasionally slightly pubescent with few scattered hairs along the midrib on the under surface, the margin subrevolute, lightly and obscurely denticulate, the veins (ca. 15 pairs)

conspicuous beneath but not more prominent than the outstanding network of secondary and lesser veins, the petiole ca. 5 mm. long, usually glabrous or becoming so. Flowers solitary, axillary; pedicel appressed-pubescent at first, later becoming glabrous, 10–15 cm. long; bracteoles 2, opposite or slightly alternate, quickly caducous, when present unequal, triangular, 3–3.5 mm. long, ca. 2.5 mm. wide at the base, pubescent; calyx-lobes 5, imbricate, unequal, broadly ovate, obtuse or subrotund at the apex, ca. 8 mm. long, 8–9 mm. wide, densely appressed-hoary-pubescent on the external surface, glabrous within, the outer lobes thicker with over-all pubescence, the inner lobes pubescent only at the center with the margins scarious and less pubescent; corolla-lobes 5, connate at the base, 10–12 mm. long, ca. 9 mm. wide, appressed-hoary-pubescent on the median portion of the external surface; stamens 40 45, seriate, 6–8 mm. long, the filaments unequal, 3–4.5 mm. long, joined at the base and adnate to the base of the corolla, villous, the anthers nearly equal, ca. 3 mm. long, villous, tapering into a short apicule; ovary ovoid-conical, densely canescent, 5-celled, multi-ovulate, tapering at the apex into the style, the style glabrous except at the very base, 5-parted or tending to split into 5 parts. Fruit subconical-globose, ca. 1 cm. diam., hoary-pubescent, 5-celled, many-seeded; seeds brown, shining, ca. 1.5 mm. long.

This species was the first of the genus described from the Philippines. One of the most outstanding characters is the reticulate appearance of the veins, especially on the lower surface. All veins, from the primary to the finer reticulations are of almost uniform prominence. The canescent pubescence of the calyx, corolla, ovary and that persisting through the fruiting stage on the calyx and fruit present another character excellent for distinguishing the species.

Two specimens cited present considerable variation in leaf-size. *Ramos & Edaño 28736* collected in Tayabas Prov. of Luzon has leaves over 15 cm. long and, in some instances more than 8 cm. wide. The flowers are immature and appear smaller than those of the typical specimen. However, the distinct veining and pubescence are the same. On the other hand, *Ramos & Edaño 26630,* from the same province, has leaves 8–15 cm. long and only 2–3 cm. wide. The calyx-lobes are smaller also, ca. 6 mm. long. However, like the specimen mentioned immediately above, in other respects, it agrees with the typical specimen.

VERNACULAR NAME: *Kamiin* (Sambáli).

21. **Adinandra elliptica** C. B. Robinson in Philipp. Jour. Sci. Bot. 3: 206. 1908. — Merrill, Enum. Philipp. Fl. Plts. 3: 72. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

Adinandra integerrima Vidal, Rev. Pl. Vasc. Filip. 56. 1886. Non T. Anderson.

Adinandra dumosa Vidal, Sinopsis Fam. Gen. Pl. Filip., Atlas 14, t. 13, f. A. 1883. Non Jack.

Adinandra Robinsonii Elmer, Leafl. Philipp. Bot. 8: 2836. 1915. — Merrill, Enum. Philipp. Fl. Plts. 3: 73. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Luzon (Benguet, Nueva Ecija, Nueva Viscaya, Sorsogon), Mindanao (Bukidnon, Davao, Misamis), Mindoro, Negros (Negros Oriental), Panay.

LUZON: Benguet Prov.: Sablan, *R. S. Williams 1369* (ISOTYPES NY, US),

Nov. 18, 1904 (flowers whitish). — Baguio, *R. S. Williams 1115* (NY, US), June 29, 1904. — *M. S. Clemens 17196* (NY), Dec. 1920. — *E. D. Merrill 1766* (G, M), May 1914. Nueva Ecija Prov.: Mt. Umingan, *M. Ramos & G. Edaño* [P.B.S.] *26470* (A, US). Nueva Viscaya Prov.: *M. Ramos & G. Edaño* [P.B.S.] *45597* (A, NY), May-June 1925. Prov. Sorsogon: *M. Ramos* [P.B.S.] *23359* (A, NY, US), July-Aug. 1915. MINDANAO: Davao Distr.: Mt. Apo, Todaya, *A. D. E. Elmer 11461* (ISOTYPES of *A. Robinsonii*, A, C, G, M, NY, US), Aug. 1909. Bukidnon Subprov.: Mt. Lipa, *M. Ramos & G. Edaño* [P.B.S.] *38496* (A, US), [P.B.S.] *38981* (A), June-July 1920. — *A. L. Cenabre* [P.B.F.] *29624* (A, NY), June 1924. MINDORO: *M. L. Merritt* [P.B.F.] *8720* (NY, US), Jan. 1928. — Mt. Calavite, *M. Ramos* [P.B.S.] *39415* (A), [P.B.S.] *39487* (A), April 1921. NEGROS: Prov. Negros Oriental, Dumaguete, Cuernos Mts., *A. D. E. Elmer 10185A* (M, NY, US), May 1908. PANAY: Prov. Antique, *R. C. MacGregor* [P.B.S.] *32537* (A), May-Aug. 1918.

Small tree; branchlets terete, brownish, glabrescent, the very young branchlets and terminal buds ferrugineous-tomentose. Leaves submembranaceous, oblong-elliptic, (3.5–) 6–10.5 cm. long, (1.5–) 2.5–3.5 cm. wide, acuminate at the apex, narrowed at the base, usually glabrous above, straggling to densely pubescent beneath, glabrescent at maturity except along the midrib and margin, the margin glandular-serrate, sometimes ciliolate, the veins ca. 15 pairs, somewhat prominent beneath with all the orders of veins equally conspicuous, the petiole 2.5–6 mm. long, usually pubescent. Flowers axillary, solitary; pedicels up to 3.5 cm. long, slender, usually somewhat recurved, thinly pubescent; bracteoles 2, caducous, opposite and immediately below calyx; calyx-lobes 5, imbricate, broadly ovate, unequal, 6–7 mm. long, ca. 5 mm. wide; not as thick as in most species with less conspicuous variation at the margin, glandular-denticulate, the two outer lobes straggling-pubescent, the inner lobes quite glabrous; corolla-lobes 5, connate at the base, ovate, quite acute at the apex, densely pubescent in the middle of the exterior surface, ca. 10 mm. long, 4–5 mm. wide; stamens ca. 30, appearing as a single series, the filaments glabrous, 2–3 mm. long, adnate to the base of the corolla, joined inconspicuously, appearing almost free, the anthers 2–4 mm. long, densely pubescent, with an apicule ca. 1 mm. long; ovary subconical, 3-celled, densely pubescent, tapering at the apex into a glabrous style ca. 1 cm. long, the ovules many. Fruit ca. 1 cm. diam., 3-celled, straggling-pubescent, multi-ovulate, the seeds minute, dark brown-black.

The outstanding characters of this species are: (1) the submembranaceous elliptic leaves; (2) the generally long slender pedicels; (3) the 3-celled ovary and fruit; (4) the 1 cm. long entire glabrous style; (5) the thin calyx-lobes; (6) the glabrous, nearly free filaments and pubescent anthers; (7) the seemingly always caducous bracteoles; and (8) the rather straggling pubescence.

Adinandra Robinsonii Elmer is included here as a synonym. After studying the species, I can find no characters suitable for separating them. Elmer, in introducing *A. Robinsonii,* remarked that it was very close to *A. elliptica* and offered no basis for separation. Later, Merrill suggested that the relationship seemed too close for separation, although he continued to list them as distinct entities.

Questionably cited here is *Ramos & Edaño 45597*. The style is glabrous and entire, but the leaves are thicker, more coriaceous than most specimens of *A. elliptica* and the base is less acute. *Williams 2533* from Mindanao

and *Merritt 8834* from Mindoro have leaves large for the species. However, in *Williams 2533*, the dissections of the flowers showed no differences from typical *A. elliptica*. My dissections of the ovary of the Williams number were unsatisfactory. *Merritt 8834* is a fruiting specimen. Several dissections showed the fruit to be typically 3-celled. However, on the same specimen were fruits incompletely 3-celled appearing 5- or 6-celled.

The leaves of *Elmer 10185, 10185A* from the island of Negros are smaller and the pubescence generally more dense, but typical of the species. This latter character is true especially of the pedicel and calyx-lobes.

VERNACULAR NAME: *Puyaka* (Mangyan).

22. **Adinandra Maegregorii** Merrill in Philipp. Jour. Sci. Bot. 9: 319. 1914; Enum. Philipp. Fl. Plts. 3: 73. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Luzon (Benguet, Lepanto).

LUZON: Benguet Subprov.: Pauai, *J. K. Santos* [P.B.S.] *31924* (US), April-June 1918. — Mt. Pulog, *M. Ramos & G. Edaño* [P.B.S.] *40398* (A), Sept. 1921. — Mt. Pauai, *E. Quisumbing & M. Sulit* [P.B.S.] *82356* (A, NY), March 1931. — Pauai, in forest, alt. 2100 m., *R. C. MacGregor* [P.B.S.] *8425* (ISOTYPES, NY, US), June 1909. — Pauai, *M. S. Clemens 9234* (A, G, US), Jan. 1915. — *R. J. Alvarez* [P.B.S.] *18372* (US), Jan. 1909. Lepanto Subprov.: Mt. Data, *M. Ramos & G. Edaño* [P.B.S.] *40276* (A, US), Sept. 1921. — Balili (Mt. Data), *E. D. Merrill 4650* (NY, US), Nov. 1905.

Tree 15 m.; branchlets terete, grayish, glabrous, the very young branchlets invested with a dense, tawny, appressed-villous pubescence. Leaves coriaceous, elliptic to oblong-elliptic, 5–10 cm. long, 2–4 cm. wide, apex usually acuminate, acute to somewhat rounded at the base, the margins minutely but distinctly glandular-denticulate, the upper surface glabrous except occasionally near the very base, the lower surface with scattered, appressed tawny pubescence becoming glabrescent, the veins ca. 15 pairs, anastomosing, about equally conspicuous on both surfaces, the petiole 3–5 mm. long, densely pubescent beneath, less so above. Flowers axillary, solitary; pedicels stout, recurved, up to 2.5 cm. long, measuring as much as 3 mm. diam. near the calyx, pubescent; bracteoles 2, caducous; calyx-lobes 5, imbricate, unequal, up to 10 mm. long, ca. 7 mm. wide, ovate, acute at the apex, the outer lobes straggling-pubescent over the entire external surface, the inner lobes pubescent except along the margin, glandular-denticulate; corolla-lobes 5, unequal, connate at the base, obovate, up to 14 mm. long, 7–10 mm. wide, tawny-pubescent on the median portion of the external surface; stamens ca. 30, unequal in length, 8–10 mm. long, probably seriate, the filaments firmly adnate to the base of the corolla, glabrous, 3–5 mm. long, the anthers noticeably large, ca. 5 mm. long, usually equal or subequal, hirsute, prolonged at the apex into an apicule; ovary pubescent, 3- or 4-celled, tapering gradually at the apex into a broad gradually narrowed style (in type especially) which is split into 3 or 4 parts at the apex, pubescent except near the tip, the 3 or 4 stigmas appearing oblique. Fruit not seen.

From the material examined, this species seems to be localized in the Pauai area of Benguet Subprovince. All the material cited above, save two sheets from the adjoining Subprovince of Lepanto, are from Benguet. These Lepanto sheets are *Merrill 4650* and *Ramos & Edaño 40276*, collected at Mt. Data.

The ovary is generally three-celled and the style three-parted, three-ridged or entire. The type specimen seems to be the exception. Only two dissections were possible from the type and both showed a four-celled ovary. This was to be expected as the style, in both cases, was four-parted. On the same specimen were styles that were three-parted. In the type, the style is very thick at the base, and although tapering somewhat towards the apex remains quite bulky. In other cases, where the style is three-parted, the tapering is more finely drawn out. There is variation in the extent of pubescence of the style. It may be present on the lower half only or may extend up to the divided portion. Never is the style completely pubescent.

The leaves are coriaceous, resembling in shape those of *A. elliptica* C. B. Robinson, the closest relative, the base, however, usually being more rounded.

In *A. elliptica*, the floral parts are generally smaller. The calyx-lobes measure 6–7 mm. and the corolla-lobes 10 mm. in length. The style is glabrous and always entire. The leaves are membranaceous or submembranaceous and taper at both ends.

These two species are very difficult to separate, especially in the early stages of leaves and flower.

VERNACULAR NAME: *Batinai* (Igorot).

23. **Adinandra maquilingensis** Merrill in Philipp. Jour. Sci. Bot. 9: 317. 1915; Enum. Philipp. Fl. Plts. 3: 73. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925. — Sasaki, Cat. Governm. Herb. 347. 1930.

DISTRIBUTION: Luzon (Laguna, Tayabas).

LUZON: Laguna: Mt. Maquiling, *M. Ramos* [P.B.S.] *13650* (ISOTYPES, C, US), Sept. 1911. — Los Baños, Mt. Maquiling, *A. D. E. Elmer 17687* (A, C, G, M, NY, US), *18200* (A, C, G, M, NY, US), June-July 1917. Tayabas: Umiray, *A. Loher 13999* (A).

Small tree ca. 12 m. high; branchlets terete, brownish, generally glabrous, except at the very tips where finely appressed-pubescent. Leaves coriaceous, oblong-elliptic to oblong-obovate, 3.5–6 cm. long, 1.5–2.5 cm. wide, acuminate at the apex, acute at the base, glabrous above, sparsely straggling-pubescent or glabrous beneath (pubescent when very young), the margins crenulate-denticulate along the upper half, the lower half quite entire, the veins ca. 12 pairs, distinct but not prominent, the petioles 3–5 mm. long, occasionally pubescent on the lower surface. Flowers axillary, solitary; pedicels stout, recurved, straggling-pubescent at first, later glabrous, 1.5–2 cm. long; bracteoles 2, caducous, elongate-obovate when present, ca. 6 mm. long, 3 mm. wide, straggling-pubescent; calyx-lobes 5, imbricate, narrow-ovate, apiculate, unequal, the outer lobes ca. 8 mm. long, 4.5–5 mm. wide, pubescent over all, the inner 3 lobes somewhat broader, ca. 8 mm. long, 6–6.5 mm. wide, pubescent in the center, glabrous at the membranous margin; corolla-lobes 5, connate at the base, unequal, obovate, tapering quickly and abruptly at the base, obtuse at the apex, 11.5–12 mm. long, 5–7 mm. wide, pubescent on the median portion of the exterior surface; stamens ca. 35, 7–9 mm. long, unequal, the filaments 4–6 mm. long, generally glabrous, pubescent only where joined to the anthers, the anthers

ca. 3 mm. long, densely hirsute; ovary pilose, 3-celled, multi-ovulate, the style hirsute, 7 mm. long, 3-parted, the apices glabrous. Mature fruit not seen.

From the material examined, it appears that this species is localized in the Mount Maquiling area in the Province of Laguna on the Island of Luzon.

The bracteoles although caducous do not fall as quickly as those in the majority of species. When present, they are unusual in character, being long-obovate (6 × 3 mm.) and nearly equalling the calyx in length. The calyx-lobes themselves are characteristic, long and quite narrowly ovate, tapering to a distinct apicule, and covered with a straggling pubescence. The anthers are, as usual, hirsute with the pubescence extending down the filaments for a short distance which are glabrous for most of their length. The ovary is pilose, 3-celled and multi-ovulate, tapering into a style hirsute for almost its entire length, glabrous only at the very apex which is 3-parted.

24. **Adinandra Loheri** Merrill in Philipp. Jour. Sci. Bot. 9: 318. 1914; Enum. Philipp. Fl. Plts. 3: 72. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.
Adinandra rostrata Merrill, in op. cit. 316. — Melchior, loc. cit.
Adinandra coriacea Merrill, in op. cit. 317. — Melchior, loc. cit.

DISTRIBUTION: Luzon (Rizal, Laguna).

LUZON: Rizal: Oriud, in primary forests at medium altitudes, *A. Loher 5604* (ISOTYPE, K), Dec. 1905. — Montalban, *A. Loher 12642* (A), Oct. 1912. — *A. Loher 14486* (A), Oct. 1913. Laguna: Dahican River, *M. Ramos* [P.B.S.] *1567* (ISOTYPES of *A. rostrata*, M, NY), Sept. 13, 1912. — *F. L. Amarillas* [P.B.F.] *24663* (NY, US), Nov. 1915.

Tree, generally glabrous except the terminal vegetative buds and very young branchlets; branchlets terete, grayish, the terminal buds tawny-villous. Leaves coriaceous, oblong-elliptic, glabrous or glabrescent, 8–14 cm. long, 3.5–6.5 cm. wide, broadly rounded to broadly or shortly acuminate at the apex, acute at the base tapering into the petiole, the margin crenulate to crenulate-denticulate, the veins 11–15 pairs, anastomosing near the margin, the petiole 5–7 mm. long. Flowers axillary, solitary; pedicels glabrous, curved, 2–4 cm. long; bracteoles 2, opposite, immediately below the calyx, persistent, unequal, broadly triangular to suborbicular, 2.5 × 3 mm. and 2.5 × 2.5 mm., scattered appressed-pubescent, the margins ciliolate; calyx-lobes 5, imbricate, thickened, glabrous, decidedly rounded (often splitting) at the apex, unequal, wider than long, ca. 5.5–6 mm. long, 6–7 mm. wide; corolla-lobes 5, connate at the base, obovate to broadly obovate, ca. 1.5 cm. long, 1.2 cm. wide, pubescent on the median portion of the dorsal surface; stamens 40–50, adnate to the base of the corolla, unequal, 7–11 mm. long, the filaments 4–8 mm. long, joined nearly their entire length, hirsute on the external surface, the anthers ca. 3 mm. long, oblong, acute, hirsute; ovary glabrous, conical-ovoid, 3-celled, multi-ovulate, tapering at the apex into a glabrous, entire style ca. 6 mm. long. Fruit glabrous, globose, ca. 1.5 mm. diam., 3-celled; seeds ca. 25, dark, shining, scrobiculate, 5–6 mm. long.

The nearly glabrous character of this species is one of its unusual features. The terminal buds and very young branchlets, the dorsal surface

of the corolla-lobes and the stamens appear to be the only exceptions. The anthers are always hirsute, even in the most glabrous species. Another feature of note is the persistent, opposite bracteoles.

Merrill, in his original description of this species, records the ovary as 5-celled. In all the material examined the ovary and fruit are consistently 3-celled. Undoubtedly Merrill had poor material at his disposal when he devised this species, since the fruit is not described and the ovary is recorded as 5-celled. An isotype in the Kew herbarium which has been available for this study possesses both fruit and flowers. Had Merrill had such a specimen he would have seen the relationship between *A. rostrata* and *A. Loheri* at the time of publication, since they were published simultaneously. *Adinandra rostrata* was published from the fruit alone. The type material of this latter entity shows the very large 3-celled fruit with large (5–6 mm. long) seeds which are few (10–20) in number. The pedicel is unusually long, measuring up to 4 cm. *Adinandra Loheri* was described from flowering material in which the pedicels measured 2 cm. in length. Unfortunately the two specimens used as types of these two species represented the extremes in pedicel length, and since one was described from flowers and the other from the fruit they appeared to be different. Since then material has been collected which includes this variation in pedicel-length. In *Loher 12642*, a flowering specimen, the pedicels vary from 2–3.5 cm. in length on the same specimen.

Although several Philippine species are known to have 3-celled fruit, this is the only species in which the fruit has been described. It agrees with those Indo-Malayan species with 3-celled fruit in having fewer but larger seeds than the species in which the fruit is 5-celled.

VERNACULAR NAME: *Malambot* (Tagálog).

25. **Adinandra leytensis** Merrill in Philipp. Jour. Sci. Bot. 9: 377. 1914; Enum. Philipp. Fl. Plts. 3: 72. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Leyte.

LEYTE: Masaganap, near Jaro, in forests, alt. 600 m., *C. A. Wenzel 760* (ISOTYPES, A, C, M, US), May 27, 1914.

Tree 17 m. high; branchlets terete, glabrous, brown, the terminal buds appressed-tawny-pubescent. Leaves coriaceous, subelliptic, 5–8 cm. long, 2.5–4 cm. wide, obtuse to rounded at the apex, narrowly acute at the base, glabrous, somewhat shining, greenish above, roughened, darker, appressed-pubescent beneath, the margin obscurely denticulate, the veins ca. 12 pairs, prominent on both surfaces, anastomosing near the margin, the reticulations very distinct on both surfaces, the petioles ca. 5 mm. long. Flowers axillary, solitary; pedicels recurved, stout, ca. 1.3 cm. long, scattered-pubescent; bracteoles 2, opposite, immediately below the calyx, persistent, unequal, ca. 2 × 3 and 3 × 4 mm., broadly rounded, closely appressed-pubescent, the surface rough, thick, the margins ciliolate; calyx-lobes 5, imbricate, rounded, finely appressed-pubescent, unequal, the outer two ca. 5 mm. long, 6–6.5 mm. wide, thick with little or no scarious margin, eciliate, the inner three gradually thinner toward the margin becoming scarious, somewhat ciliolate; corolla-lobes 5, connate at the base, obovate,

ca. 13 mm. long, 8.5–10 mm. wide, rounded at the apex, tapering rapidly and thickened at the base, finely appressed-pubescent on the external surface except along the scarious margin; stamens ca. 40, unequal, 6–10 mm. long; filaments extremely variable in length, 2–6 mm. long, joined the entire length of the shortest filaments, densely hirsute except for ca. 1 mm. at the base of the external surface where they are adnate to corolla, the anthers ca. 4 mm. long, approximately equal in length, hirsute, lanceolate; ovary glabrous, conical-ovoid, 3-celled, multi-ovulate, tapering at the apex into an entire glabrous style ca. 7 mm. long. Fruit not seen.

The characters helpful in distinguishing this species are: (1) the unequal persistent bracteoles; (2) the roughened, thick, pubescent calyx-lobes; (3) the long stamens with the filaments joined their entire length forming a tube and sufficiently adnate to the base of the corolla (1 mm.) to fall off intact with the corolla; (4) the glabrous 3-celled ovary; and (5) the glabrous entire style.

The veining of the leaves of the species resembles very much that found in those of *A. luzonica* Merrill. However, the apex of the leaf of the present species is rounded and the pubescence of the under surface less distinct. The midrib also is more roughened.

26. **Adinandra nigro-punctata** Merrill in Philipp. Jour. Sci. Bot. 9: 320. 1914; Enum. Philipp. Fl. Plts. 3: 73. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Leyte.

LEYTE: Dagami, in forests, *M. Ramos* [P.B.S.] *15355* (ISOTYPE, US), Aug. 13, 1912.

Tree ca. 10 m. high; branchlets numerous, terete, glabrous, grayish brown, pubescent at very tip only and reddish brown when very young, the terminal buds pubescent. Leaves coriaceous, glabrous except when unfolding, elliptic-oblong, 4–7 cm. long, 1.5–3 cm. wide, the apex broadly blunt-acuminate, minutely retuse, the base acute, the margin obscurely glandular-denticulate, the veins 7–8 pairs, equally evident on both surfaces, the petiole ca. 5 mm. long. Flowers axillary, solitary; pedicels glabrous, stout, ca. 2 cm. long; bracteoles 2, persistent, opposite, immediately below the calyx, glabrous, unequal, suborbicular to obovate, ca. 3 mm. long, 3–4 mm. wide; calyx-lobes 5, imbricate, glabrous, subequal, rounded at the apex, the 2 outer lobes smaller, ca. 7–8 mm. long and broad, the margin lightly ciliolate, the inner 3 lobes longer, ca. 10 mm. long, 7–8 mm. wide, the margin more noticeably ciliolate; corolla-lobes [descrip. fide Merrill] 5, broadly rounded, slightly retuse, the median exposed parts (dorsal surface) very densely hirsute, otherwise glabrous; stamens (fide Merrill) about 50, the filaments 5 mm. long, densely hirsute, the anthers ovate-lanceolate, somewhat acuminate, 4 mm. long, densely hirsute; ovary glabrous, ovoid, 5-celled, the ovules very numerous in each cell; style glabrous, 12 mm. long, the stigma minute, subcapitate.

The only authentic material available for this study is a sterile representative of the type, deposited in the United States National Herbarium. It has been necessary to rely, to a great extent, upon the original description by Merrill.

Features of distinction appear to be: (1) the five-celled ovary; (2) the glabrous style, 12 mm. long; (3) the pubescent filaments, 4 mm. long;

(4) the large corolla-lobes, 18 mm. long, pubescent on the external surfaces; and (5) the glabrous, subequal calyx-lobes, 7–10 mm. long, 7–8 mm. wide.

Very closely allied, and perhaps conspecific with it, is *A. apoensis* Elmer from Mindanao. However, until more material is available for study, I prefer to retain them both as species.

The five-celled ovary is found only in two other species, namely *A. luzonica* Merrill and *A. apoensis*. In the former species, the ovary, style, calyx-lobes, bracteoles and pedicel are covered with a dense, canescent pubescence which makes separation quite easy.

27. **Adinandra apoensis** Elmer, Leafl. Philipp. Bot. 8: 2833. 1915, "apoense." — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 144. 1925.
Adinandra Merrillii Elmer, in op. cit. 2834. — Melchior, loc. cit.

DISTRIBUTION: Mindanao (Davao, Agusan).

MINDANAO: Davao: Todaya, Mt. Apo, *A. D. E. Elmer 11265* (ISOTYPES, A, C, G, M, NY, US), Aug. 1909. — Mt. McKinley, *R. Kanehira 2704* (NY), Aug. 1930. Agusan: Cabadbaran, Mt. Urdaneta, *A. D. E. Elmer 14088* (ISOTYPES of *A. Merrillii*, A, C, G, M, NY, US), Oct. 1912.

Tree ca. 15 m. high; branchlets terete, relatively short and numerous, grayish, the terminal bud appressed-pubescent. Leaves coriaceous, glabrous, elliptic-oblong, 5–9 cm. long, 2.5–4 cm. wide, broadly rounded or obtuse at the apex, occasionally slightly emarginate, cuneate at the base, the margin crenately serrate towards the apex, entire towards the base, the veins 7–8 pairs, the primary veins evident on both surfaces, the reticulations prominent on the lower surface only, the petiole glabrous, ca. 5 mm. long. Flowers axillary, solitary; pedicel 1–1.5 cm. long, stout, glabrous, recurved; bracteoles 2, persistent, glabrous, opposite, immediately below the calyx, unequal, 1.5–2 mm. long, 2.5–3 mm. wide, broadly rounded, lightly glandular-denticulate along the margin; calyx-lobes 5, imbricate, glabrous, unequal, thickened at the base, broadly ovate to rounded, 8–9 mm. long, 7–8 mm. wide, the margins quite entire; corolla-lobes 5, connate at the base, obtuse at the apex, ca. 13 mm. long, 8–10 mm. wide, pubescent on the median portion of the external surface; stamens ca. 35, unequal in length, 6–11 mm. long, probably seriate, the filaments 2–7 mm. long, joined at the base only and adnate to the corolla, very hirsute, the anthers usually ca. 4 mm. long, occasionally shorter, apiculate, equally hirsute; ovary glabrous, globose (not conical), 5-celled, multiovulate, the style terete, entire, glabrous, 1.5 cm. long, rising abruptly from the ovary, not tapering. Fruit not seen.

This species appears very distinct from *A. leytensis* Merrill, with which it formerly was considered synonymous. In *A. apoensis*, the style is easily 1.5 cm. long, and rises abruptly from a globose, 5-celled glabrous ovary. In *A. leytensis* the style is only 7 mm. long, approximately one-half as long as that found in *A. apoensis*, and it tapers gradually from a conical 3-celled ovary.

The leaves in *A. leytensis* have ca. 12 pairs of veins and the reticulations on the under surface are very distinct. Also the calyx-lobes are wider than long, very rounded at the apex and measure 5 × 6–6.5 mm. In *A. apoensis* there are only ca. 7 or 8 pairs of veins and the reticulations,

although obvious, are less conspicuous. The calyx-lobes are broadly ovate, longer than broad, and measure 8–9 × 7–8 mm.

Cited here as a synonym is *A. Merrillii* Elmer. Having studied the types of both species, I can see no differences separating the two. Elmer mentions in the original description of *A. Merrillii* that the ovary was "very lightly woolly." The material was very sparse, hence only a single ovary was studied. This appears to be glabrous and five-celled. No mention of the number of ovary-cells was made in the original description. Elmer also refers to the number of stamens as "3". This undoubtedly is a typographical error. An accurate count could not be made from the very poor specimen I examined. However, the number appears to be 30 or more.

The closest relative appears to be *A. nigro-punctata* Merrill. So far, material of *A. apoensis* has been collected only from Mindanao. *Adinandra nigro-punctata* seems to have been collected only once, from the type locality in Luzon. Future collections may show additional distinguishing characters.

VERNACULAR NAMES: *Malagsam* (Bagóbo), *Sañgnanan* (Monóbo).

EXCLUDED SPECIES

Cleyera japonica Thunberg emend. Sieb. & Zucc. var. **montana** (Merrill), comb. nov. *Adinandra montana* Merrill in Philipp. Jour. Sci. Bot. 5: 363. 1910; Enum. Philipp. Fl. Plts. 3: 73. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925. Not *A. montana* Ridley (1915).

DISTRIBUTION: Luzon (Benguet, Cagayan, Camarines, Ilocos Norte, Laguna, Nueva Ecija, Nueva Viscaya, Rizal, Tayabas), Mindanao (Bukidnon, Davao, Misamis).

LUZON: Prov. Benguet: Mt. Pulog, *H. M. Curran, M. L. Merritt & T. C. Zschokke* [P.B.F.] *18149* (US), Jan. 1909. — "Haights in the Oaks," alt. 2300 m., *E. A. Mearns* [P.B.S.] *4420* (US), July 1907. — Pauai, *J. K. Santos* [P.B.S.] *31932* (NY), April-June 1918. — Mt. Baudan, *M. Ramos & G. Edaño* [P.B.S.] *40314* (A, US), Sept. 1921. — Mt. Pulog, *M. Ramos & G. Edaño* [P.B.S.] *44906* (A, NY), Feb.-March 1925. Prov. Cagayan: Mt. Dos Cuernos, along streams near the foot of the mt., alt. 1000 m., *M. Ramos* [P.B.S.] *76995* (A), April 26, 1929, (3–6 m. high). — Mt Tabuan, on ridges of slopes, alt. 2000 m., *M. Ramos* [P.B.S.] *77107* (A), May 19, 1929 (4 m. high; flowers whitish yellow). Prov. Camarines: *M. Ramos 1587* (M, NY), Dec. 1918. Prov. Ilocos Norte: Mt. Palimbin, *M. Ramos* [P.B.S.] *33318* (A, US), Aug. 1918. Prov. Laguna: Mt. Cristobal, *F. Canicosa* [P.B.F.] *25950* (A), March 1922. — Mt. Bonahin, moist ridge, alt. 1350 m., *T. Fajatin* [P.B.F.] *31116* (NY), April 4, 1929 (tree 10 m. high; flowers white). Prov. Nueva Ecija: *R. J. Alvarez* [P.B.F.] *22191* (US), Dec. 1910. — Mt. Umingan, *M. Ramos & G. Edaño* [P.B.S.] *26255* (A, US), Aug.-Sept. 1916. Prov. Nueva Viscaya: Mt. Alzapan, *M. Ramos & G. Edaño* [P.B.S.] *45623* (NY), May-June 1925. Prov. Rizal: Montalban, *A. Loher 12346* (A), Oct. 1909. — Mt. Lumutan, *M. Ramos* [P.B.S.] *42298* (M), April 1923. Prov. Tayabas: Mt. Camatis, *Alcasir & G. Edaño 4513* (A), *4487* (A), May 1939. — *F. Canicosa* [P.B.F.] *30017* (US), April 1925. — *H. M. Curran & M. L. Merritt* [P.B.F.] *7846* (US), Nov. 1907.

MINDANAO: Prov. Bukidnon: Mt. Lipa, *M. Ramos & G. Edaño* [P.B.S.] *38493* (A), June-July 1920. — Mt. Candoon, *M. Ramos & G. Edaño* [P.B.S.] *38933* (A, US), June-July 1920. — Vicinity of Tanculan, *E. Fenix* [P.B.S.] *26063* (A, US), July 1916. Prov. Davao: Mt Colelan, forested ridge, alt. 1900 m., *A. D. E. Elmer 10620* (A, C, G, M, NY, US), May 1909. — Todaya, Mt. Apo, wooded ridge,

alt. 2300 m., *A. D. E. Elmer 11465* (A, C, M, NY, US), Aug. 1909. Prov. Misamis: Mt. Matindang, *E. A. Mearns & W. I. Hutchinson* [P.B.F.] *4558* (ISOTYPES of *A. montana,* M, NY, US), May 1906.

Small tree 4–10 m. high; branchlets terete, reddish brown, glabrous even to the very young growth, including the terminal buds. Leaves coriaceous, glabrous, elliptic-ovate to elliptic-oblong, 5–8 (–10) cm. long, 2–3.5 (–4) cm. wide, usually more or less acuminate at the apex, sometimes blunt and shortly so, acute at the base, the margin entire, somewhat revolute in drying, the veins generally obscure, occasionally faintly visible on the upper surface, the petiole 5–10 mm. long, glabrous. Flowers axillary, up to 5 in an axil, sometimes solitary; pedicel stout, usually 1–2 cm. long, occasionally slightly shorter, glabrous; bracteoles 2, opposite or alternate, quickly caducous, when present minute, quite scale-like, deltoid, ca. 1–1.5 mm. long; calyx-lobes 5, imbricate, glabrous, unequal ca. 3 mm. long, sometimes shorter, ca. 3 mm. wide, fimbriate-ciliolate along the margin, the outer lobes abruptly apiculate, the inner lobes more rounded; corolla-lobes 5, glabrous, obovate to narrowly obovate, 9–12 mm. long, 4–5 mm. wide; stamens ca. 25, unequal in length, 4–7 mm. long, the filaments glabrous, adnate to the base of the corolla, sometimes appearing free, the anthers ca. 1 mm. long, very slightly retrorse-pilose; ovary glabrous, 3-celled, tapering into a glabrous style which is usually 3-parted, sometimes slightly so, occasionally incompletely so, topped by three stigmas. Fruit ovoid to globose, glabrous, three-celled, sometimes incompletely so, ca. 1 cm. diam.; the seeds minute, brown, varying in number.

This is the first record of the genus *Cleyera* from the Philippine Islands. Described originally under *Adinandra,* this new variety of *Cleyera japonica* Thunb. has been collected profusely in many provinces of Luzon and Mindanao.

.The axial placentation of the ovary, the retrorse pubescence of the anthers, the entire leaves and glabrous terminal buds, the 3-parted style and 3-celled ovary, and the very small, subrotund, conspicuously ciliolate calyx-lobes are characteristics of *Cleyera* rather than *Adinandra.*

There is considerable variation in the parts of the flower but none appear consistent enough for specific delimitation. Ordinarily the calyx-lobes are approximately 3 mm. long and about as wide. In *Curran & Merritt 7846* and *Canicosa 30017* from Tayabas, *Loher 12346* from Benguet and *Canicosa 28980* from Laguna Province in Luzon the calyx-lobes are smaller, measuring only 2 mm. in length and width. However, in *Mearns 4420* and *Ramos & Edaño 44906* from Mt. Pulog, Benguet Province, the calyx-lobes measure 2.7 mm. and 3.5–4 mm. respectively.

There is also variation in the pedicel-length and the size of the leaf. Ordinarily, the pedicel measures 1.5–2 cm. long. In the first two specimens mentioned above, namely *Curran & Merritt 7846* and *Canicosa 30017*, the pedicel measures only 7 mm. These two specimens are generally smaller in most characters. In *Ramos & Edaño 40314* from Mt. Baudan, Benguet Prov., the calyx-lobes are 2 mm. long but the pedicel measures 2 cm. *Ramos & Edaño 44906* from Mt. Pulog has pedicels measuring 2 cm. in length.

In the original description, no mention is made of the three-parted style and the fact that more than one flower is usually found in the axil. The degree of splitting in the style is variable. Entire styles and three-parted styles in varied stages may be found on the same specimen. However, the tendency to split is evident in all specimens. Also, the presence of more than one flower (up to five) is more prevalent than the solitary flower in the axil. These are all characters of typical *Cleyera*.

VERNACULAR NAMES: *Abu-abu, paniasan.*

Ternstroemia urdanetensis (Elmer), comb. nov.

Adinandra urdanetensis Elmer, Leafl. Philipp. Bot. 8: 2837. 1915 "urdanetense." — Merrill, Enum. Philipp. Fl. Plts. 3: 73. 1923.

Ternstroemia epiphytica Elmer ex Merrill, Enum. Philipp. Fl. Plts. 3: 73. 1923, in syn.

DISTRIBUTION: Mindanao, Luzon.

MINDANAO: Agusan: Cabadbaran, Mt. Urdaneta, *A. D. E. Elmer 14078* (ISOTYPES of *A. urdanetensis,* A, C, G, M, US), Oct. 1912. LUZON: Prov. Sorsogon: Irosin, Mt. Bulusan, *A. D. E Elmer 15851* (A, NY, US), *17317* (A, NY, US), April & Sept. 1916. — Bulusan Volcano, *M. Ramos* [P.B.S.] *23671* (A, C, NY, US), Sept. 1915.

This species of *Ternstroemia* was first described as *Adinandra urdanetensis* by Elmer. Later, Elmer gave it the herbarium name *T. epiphytica,* which name Merrill, probably not realizing the relationship with *A. urdanetensis,* published in his Enumeration.

INDO-MALAYSIAN SPECIES

In this group are classified the species found in East Bengal, Ceylon, Siam, the Malay Peninsula, the Netherlands East Indies, Sarawak, and British North Borneo. Including the thirteen new species proposed here, there have been fifty-two species described under *Adinandra* which fall in this geographical group. Of these, twenty-four are recognized below, two are excluded from the genus, two are recorded as doubtful species and three are listed as little known.

It is with regret that I list species as "doubtful" or "little known." Material of these species can surely be found in the herbaria of Malaya and the Netherlands East Indies, perhaps in abundance — but at present, under the strict shipping conditions in the Pacific area, the material is not available for this study. As a result of the war some of the material may never be available.

Because of the lack of this material, my interpretations of some of the species of this group may be open to question. In too many instances it has been necessary to draw conclusions from a single specimen, often incomplete at that. In other cases decisions have been reached and the original descriptions only recorded when no material has been available at all. This information has been gathered, often very laboriously, from literature which appears annoyingly incomplete according to our present standards and which could apply easily to almost any species previously described. However precarious as it may be, I have attempted to bring

together the species of this geographical group which are presented below.

In this geographical area is found the true center of distribution of the genus. Species are much more varied in form than those of the Philippine Islands and Eastern Asia. Also, the number of species is considerably greater.

As in the two former groups, I am recording a chart, compiled during this study, which brings together the characters most used in identification, and under these headings have listed the respective species.

CHART FOR INDO-MALAYSIAN SPECIES OF ADINANDRA

Bracteoles		Calyx-lobes	
PERSISTENT	CADUCOUS	PUBESCENT	GLABROUS
acuminata	*borneensis*	*acuminata*	*angulata*
angulata	*coarctata*	*borneensis*	*Brefeldii*
Brefeldii	*dasyantha*	*caudatifolia*	*celebica*
caudatifolia	*Griffithii*	*Clemensiae*	*collina*
celebica	*javanica*	*coarctata*	*dumosa*
Clemensiae	*lutescens*	*colombonensis*	*excelsa*
colombonensis	*myrioneura*	*cordifolia*	*Griffithii*
collina	*oblonga*	*cordifolia*	*impressa*
cordifolia	*phlebophylla*	*strigosa*	*polyneura*
cordifolia	*plagiobasis*	*Corneriana*	*quinquepartita*
strigosa	*villosa*	*dasyantha*	*Sarosanthera*
Corneriana		*Hullettii*	*verrucosa*
dumosa		*integerrima*	
excelsa		*javanica*	
Hullettii		*lasiopetala*	
impressa		*lutescens*	
integerrima		*maculosa*	
lasiopetala		*magniflora*	
maculosa		*myrioneura*	
magniflora		*nunkokensis*	
nunkokensis		*oblonga*	
parvifolia		*parvifolia*	
polyneura		*plagiobasis*	
quinquepartita		*phlebophylla*	
Sarosanthera		*subsessilis*	
subsessilis		*villosa*	
verrucosa			

Corolla-lobes		Filaments	
PUBESCENT	GLABROUS	PUBESCENT	GLABROUS
acuminata	*angulata*	*acuminata*	*angulata*
borneensis	*Clemensiae*	*borneensis*	*dasyantha*
Corneriana	*collina*	*Clemensiae*	*excelsa*
dasyantha	*colombonensis*	*collina*	*impressa*

Corolla-lobes (Continued)		Filaments (Continued)	
PUBESCENT	GLABROUS	PUBESCENT	GLABROUS
integerrima	*cordifolia*	*colombonensis*	*javanica*
javanica	*cordifolia*	*cordifolia*	*maculosa*
lasiopetala	*strigosa*	*cordifolia*	*oblonga*
lutescens	*dumosa*	*strigosa*	*phlebophylla*
myrioneura	*excelsa*	*Corneriana*	*Sarosanthera*
nunkokensis	*Griffithii*	*dumosa*	
oblonga	*Hullettii*	*Hullettii*	
parvifolia	*impressa*	*integerrima*	
plagiobasis	*maculosa*	*lasiopetala*	
phlebophylla	*magniflora*	*lutescens*	
polyneura	*quinquepartita*	*magniflora*	
subsessilis	*Sarosanthera*	*myrioneura*	
villosa	*verrucosa*	*nunkokensis*	
		parvifolia	
		plagiobasis	
		polyneura	
		quinquepartita	
		subsessilis	
		verrucosa	
		villosa	

Ovary		Style	
PUBESCENT	GLABROUS	PUBESCENT	GLABROUS
acuminata	*angulata*	*acuminata*	*angulata*
borneensis	*Brefeldii*	*caudatifolia*	*borneensis*
caudatifolia	*celebica*	*Clemensiae*	*Brefeldii*
Clemensiae	*colombonensis*	*coarctata*	*celebica*
coarctata	*dumosa*	*collina*	*colombonensis*
collina	*excelsa*	*Corneriana*	*cordifolia*
cordifolia	*Griffithii*	*integerrima*	*cordifolia*
cordifolia	*impressa*	*javanica*	*strigosa*
strigosa	*lasiopetala*	*lutescens*	*dasyantha*
Corneriana	*polyneura*	*magniflora*	*dumosa*
dasyantha	*quinquepartita*	*nunkokensis*	*excelsa*
Hullettii	*Sarosanthera*	*oblonga*	*Griffithii*
integerrima	*verrucosa*	*phlebophylla*	*Hullettii*
javanica		*villosa*	*impressa*
lutescens			*lasiopetala*
maculosa			*maculosa*
magniflora			*myrioneura*
myrioneura			*plagiobasis*
nunkokensis			*polyneura*
oblonga			*quinquepartita*
phlebophylla			*Sarosanthera*
parvifolia			*subsessilis*
plagiobasis			*verrucosa*
Sarosanthera			
subsessilis			
villosa			

Ovary

FIVE-CELLED	FOUR-CELLED	THREE-CELLED	TWO-CELLED
borneensis	*myrioneura*	*acuminata*	*nunkokensis*
celebica	*oblonga*	*angulata*	*subsessilis*
Clemensiae		*caudatifolia*	
coarctata		*Corneriana*	
collina		*javanica*	
colombonensis		*lasiopetala*	
cordifolia		*lutescens*	
strigosa		*Sarosanthera*	
dasyantha			
dumosa			
Griffithii			
Hullettii			
impressa			
integerrima			
maculosa			
magniflora			
parvifolia			
plagiobasis			
polyneura			
quinquepartita			
verrucosa			
villosa			

KEY TO THE INDO-MALAYSIAN SPECIES

A. Ovary and fruit glabrous.
  B. Stigma 3- or 5-parted; style 3- or 5-parted or deeply sulcate.
    C. Ovary and fruit 5-celled; stigma and style 5-parted or sulcate.
      D. Bracteoles caducous or vestigial. (Bengal).....28. *A. Griffithii.*
      DD. Bracteoles persistent.
        E. Leaves 9–17 cm. long, 4.5–7.5 cm. wide; veins of mature leaves inconspicuous on upper surface, not impressed; anthers hirsute. (British North Borneo: Mt. Kinabalu).....29. *A. quinquepartita.*
        EE. Leaves 4–7 cm. long, 2.5–4 cm. wide; veins of mature leaves impressed above; anthers glabrous except for rare isolated setae. (British North Borneo: Mt. Kinabalu).....30. *A. impressa.*
    CC. Ovary and fruit 3-celled; stigma and style 3-parted. (Ceylon).....
    .....31. *A. lasiopetala.*
  BB. Stigma and style entire.
    C. Ovary and fruit 5-celled; ovules many; seeds small (2 3 mm. long), many developing.
      D. Terminal buds glabrous.
        E. Pedicels slender, up to 20 mm. long; leaves with midrib smooth beneath, the blade not punctate-dotted (Malay Peninsula; East Indies).....32. *A. dumosa.*
        EE. Pedicels short and thick, 5 mm. long and ca. 3 mm. thick; leaves with midrib bisulcate beneath, the blade dark punctate-dotted. (British North Borneo: Mt. Kinabalu).....33. *A. verrucosa.*
      DD. Terminal buds appressed-pubescent.
        E. Corolla-lobes glabrous; veins conspicuous up to 12 pairs, arcuate-ascending near the margin.
          F. Calyx-lobes pubescent; filaments pubescent; leaves 6–10 cm. long, 3 4 cm. wide, the base attenuate. (British North Borneo: Mt. Kinabalu).....34. *A. colombonensis.*

FF. Calyx-lobes glabrous; filaments glabrous; leaves 9–15 cm. long, 4–6.5 cm. wide, the base rounded or obtuse. (British North Borneo).....35. *A. excelsa.*

EE. Corolla lobes pubescent; veins conspicuous, more than 20 pairs, becoming evanescent towards the margin, not arcuate-ascending. (Borneo).....36. ***A. polyneura.***

CC. Ovary and fruit 3-celled; ovules few in number; seeds large (6–8 mm. long), few (6–8) developing.

D. Leaves heavily coriaceous, the veins conspicuously elevated on both surfaces with equally conspicuous reticulations; bracteoles minute, deltoid, apiculate; branches always winged. (Pahang).....37. ***A. angulata.***

DD. Leaves coriaceous, the veins inconspicuous above, more pronounced beneath without obvious reticulations; bracteoles small, rounded at the apex; young branchlets usually terete, rarely winged or angled, the branches always terete. (Malay Peninsula; Sumatra, Java, Borneo).....38. *A. Sarosanthera.*

AA. Ovary pubescent; fruit pubescent or glabrescent, usually with a few hairs at the apex.

B. Bracteoles persistent through fruiting stage.

C. Leaves cordate at the base.

D. Mature leaves glabrous on the lower surface. (Sarawak; British North Borneo).....39. *A. cordifolia.*

DD. Mature leaves scabrous-pubescent on the lower surface. (British North Borneo: Mt. Kinabalu).....39a. *A. cordifolia* var. *strigosa.*

CC. Leaves cuneate, obtuse or rounded at the base, not cordate.

D. Style glabrous.

E. Corolla pubescent.

F. Leaves subsessile, the petiole 1–2 mm. long; pedicel very short, 1–2 mm. long; ovary 2-celled, pauci-ovulate; fruit with few (ca. 2) seeds developing, seeds large up to 8 mm. long. (Sarawak).....40. *A. subsessilis.*

FF. Leaves petiolate, the petiole 5–7 mm. long; pedicel ca. 10 mm. long; ovary 5-celled, multi-ovulate; fruit with many (over 100) seeds developing, seeds small (2–3 mm.). (Malay Peninsula).....41. *A. parvifolia.*

EE. Corolla glabrous.

F. Ovary 3-celled, pauci-ovulate; fruit 3-celled, few (10 or less) seeded, the seeds large, up to 8 mm. long. (Malay Peninsula; Sumatra, Java, Borneo).....38. *A. Sarosanthera.*

FF. Ovary 5-celled, multi-ovulate; fruit 5-celled, many (over 100) seeded, the seeds small (2–3 mm. long).

G. Bracteoles densely pubescent, broadly ovate or deltoid, unequal (5 × 5 mm. and 3 × 3 mm.); branchlets rusty-tomentose; terminal buds densely tawny-sericeous. (Malay Peninsula).....42. *A. Hullettii.*

GG. Bracteoles appressed-pubescent, subrotund, unequal (2 and 3 mm. long); branchlets appressed-pubescent near the apex, terminal buds appressed-pubescent. (Malay Peninsula).....43. *A. maculosa.*

DD. Style pubescent.

E. Corolla pubescent.

F. Ovary 3- or 2-celled, pauci-ovulate, the ovules large; fruit 3- or 2-celled, few seeded (less than 10), the seeds up to 8 mm. long.

G. Pedicels short and thick, 5 mm. long, 4 mm. in diameter; ovary and fruit 2-celled (British North Borneo: Mt. Kinabalu).....44. *A. nunkokensis.*

GG. Pedicels usually over 10 mm. long, up to 20 mm.; ovary and fruit 3-celled.
H. Branchlets, lower surface of leaves, pedicels, and bracteoles densely ferrugineous-sericeous; fruit with single seed to each cell. (Malay Peninsula).....45. *A. Corneriana.*
HH. Branchlets, lower surface of the leaves (when pubescent) and other parts lightly appressed-pubescent; fruit with more than a single seed (ca. 3) to each cell.
I. Leaves chartaceous, 5–8 mm. long, 2.5–3.5 mm. wide, nearly flask-shaped, long-caudate at the apex; seeds dark, shining. (British North Borneo: Mt. Kinabalu). .....46. *A. caudatifolia.*
II. Leaves coriaceous, up to 15 cm. long, 4–6 cm. wide, acuminate at the apex; seeds light buff, dull. (Malay Peninsula; Malacca; Sumatra).....47. *A. acuminata.*
FF. Ovary 5-celled, multi-ovulate, the ovules minute; fruit 5-celled, many (100 or more) seeded, the seeds measuring ca. 3 mm. long. (Malay Peninsula).....48. *A. integerrima.*
EE. Corolla glabrous.
F. Terminal buds glabrous; midrib on the lower surface of the leaf bisulcate; calyx-lobes glabrous. (Sarawak, British North Borneo, Borneo).....49. *A. collina.*
FF. Terminal buds sericeous or appressed-pubescent; midrib on the lower surface of the leaf rounded, not bisulcate; calyx-lobes pubescent.
G. Small leaves, 3–5 cm. long, 2–2.5 cm. wide, occasionally larger; bracteoles ca. 2 mm. long; corolla-lobes always five; seeds minute, ca. 2 mm. long, dark, shining. (British North Borneo: Mt. Kinabalu).....50. *A. Clemensiae.*
GG. Leaves larger, 6–13 cm. long, 4–7 cm. wide; bracteoles 5–6 mm. long, 6–8 mm. wide; corolla-lobes six in number; seeds minute, 1.5 mm. or less, red in color. (British North Borneo). .....51. *A. magniflora.*
BB. Bracteoles quickly caducous, seldom lasting to anthesis.
C. Leaves obliquely cordate at base. (Sarawak).....52. *A. plagiobasis.*
CC. Leaves acute or subrotund, never cordate.
D. Style glabrous.
E. Bracteoles persistent. (Southeast Borneo).....53. *A. borneensis.*
EE. Bracteoles caducous.
F. Filaments glabrous; veins up to 20 pairs, rather inconspicuous on the lower surface of the leaf, extending from the midrib at an angle of 60°. (Sumatra).....54. *A. dasyantha.*
FF. Filaments pubescent; veins over 25 pairs, conspicuous on the lower surface of the leaf, approximately perpendicular to the midrib. (British North Borneo).....55. *A. myrioneura.*
DD. Style pubescent.
E. Ovary and fruit 3-celled.
F. Bracteoles alternate (evident by scars when the bracteoles have fallen) with the lower bracteole as much as 5 mm. below the calyx; apicule on the stamen not distinctive; leaves heavily coriaceous. (Java).....56. *A, javanica.*
FF. Bracteoles opposite (scars), immediately below calyx; apicule of the stamen 3 mm. long equalling the anther in length; leaves subcoriaceous. (Siam).....57. *A. lutescens.*
EE. Ovary and fruit 5-celled (or 4-celled in *A. oblonga*).
F. Stigma 4-parted, oblique; ovary and fruit 4-celled. (Siam)..... .....58. *A. oblonga.*

FF. Stigma entire; ovary and fruit 5-celled.
G. Pedicels very short, ca. 5 mm. long. (Siam).....
.....59. *A. coarctata.*
GG. Pedicels 10–50 mm. long.
H. Filaments glabrous; calyx-lobes distinctly acute at the apex. (Indo-China).....60. ***A. phlebophylla.***
HH. Filaments sericeous; calyx-lobes rounded at the apex. (Malay Peninsula; Burma).....61. ***A. villosa.***

28. **Adinandra Griffithii** Dyer in Hooker f., Fl. Brit. Ind. 1: 282. 1874. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: East Bengal.

EAST BENGAL: *W. Griffith 755* (ISOTYPE, G).

Tree 15–20 m. with slightly angled branchlets, the branchlets glabrous even to the younger growth, the terminal buds glabrous. Leaves coriaceous, oblong-elliptic to oblong-oblanceolate, 12–15 cm. long, 4–5 cm. wide, acuminate at the apex, tapering at the base, glabrous on both surfaces, even in the very young leaves, the margin quite entire, the veins rather inconspicuous, the petioles sturdy, glabrous, semi-terete, flattened above. Flowers axillary, solitary; pedicels ca. 2 cm. long, glabrous; bracteoles 2, caducous or vestigial; calyx-lobes 5, imbricate, glabrous, rounded, ca. 8 mm. long; corolla-lobes (fide Dyer) equalling the calyx-lobes in length; stamens (fide Dyer) sparingly setose, 1-seriate, adnate to the base of the corolla; ovary glabrous, tapering into the style, the style glabrous, distinctly 5-fid, the divisions of the style cylindrical, hardly exceeding the calyx-lobes. Fruit not seen.

The above description of this species is not as complete as one might desire. Although an isotype of the species has been available for this study, little additional information can be given at present.

The outstanding feature of the species is the deeply five-parted style. In the majority of species of *Adinandra* the style is entire for the whole length. The only other known exception is *A. lasiopetala* (Wight) Choisy in which the style is three-parted. In *A. impressa* Kob. and *A. quinquepartita* Kob. dissections made from buds show the style to be five-sulcate.

The ovary of *A. Griffithii* is undoubtedly five-celled, although not mentioned as such by Dyer. Also one may assume that the corolla-lobes are glabrous on the external surface, because, were they pubescent, Dyer would have drawn attention to the fact, since he does describe the corolla. Dyer states that the bracteoles are vestigial. Observing them, I cannot be certain whether they are vestigial or caducous. I am inclined toward the latter.

A specimen deposited in the U. S. National Herbarium at Washington may be mentioned here. This specimen, collected by *Dr. King's Collector*, no. *114*, is incomplete. However, in an accompanying packet is material from previous dissections of buds showing the style definitely five-parted. The leaves are glabrous, as in the terminal bud, and the branchlets are slightly angled. The leaves are larger and less coriaceous than those of the type, measuring up to 20 cm. in length and 6.5 cm. in width.

This additional specimen collected in the "Akha Hills" is recorded from

Duffla Hill as a "tree 50 to 60 ft. high, 3 to 4 ft. in dt.; leaves green, flowers white." It was collected in Feb. 1890. The actual collector's name is not clear but appears to be "Khan." This locality, Akla Hills, or Aka Hills, as it is recorded in some gazetteers, is on the northeastern frontier of India, northeast of the Darrang District of Eastern Bengal. Duffla Hill is also recorded as Daffla Hill. Aka and Daffla are names of independent tribes. This locality agrees very well with that of the type, *Griffith 755*, which was collected in East Bengal.

29. **Adinandra quinquepartita**, sp. nov.

Arbor parva; ramis glabris, teretibus, flavo-brunneis, subrugulosis, ramulis glabris, teretibus brunneis, gemmis terminalibus conicis, glabris. Folia crasso-coriacea, elliptico-oblonga vel ovata, 9–17 cm. longa, 4.5–7.5 cm. lata, apice acuta vel late acuminata, minute emarginata, basi late cuneata vel subrotundata, undique glabra, subtus fusco-punctata, margine subintegra vel minute glandulosa, venis lateralibus primariis 8–10 paribus, marginem versus inconspicuis, venis secundariis inter primarias frequentibus, petiolis crassis, glabris, 6–10 mm. longis, ad 4 mm. diametro. Flores axillares, solitarii; pedicellis 2–3.5 cm. longis, glabris, recurvatis; bracteolis 2, oppositis, persistentibus, glabris, ca. 3 mm. longis, margine ciliolatis; sepalis 5, imbricatis, glabris, late ovatis vel subrotundatis, ca. 8 mm. longis, margine scariosis; petalis glabris; staminibus in numero ordinariis, ?-seriatis, filamentis exteriore leviter pubescentibus, antheris oblongis, leviter hirsutis; ovario glabro, conico, 5-loculari, multi-ovulato; stylo insigno, glabro, apice leviter 5-sulcato; stigmatibus 5-partitis. Fructus ignotus.

DISTRIBUTION: British North Borneo.

BRITISH NORTH BORNEO: Mt. Kinabalu, Gurulau spur, in an open place, alt. 2100–2700 m., *J. & M. S. Clemens 50781* (TYPE, A), Dec. 6, 1933 (small tree; flowers white, the stigma 5-parted).

Unfortunately, complete material was unavailable for the study of this new species. In fact the material is so incomplete that, were it not for the unusually distinctive character of the pistil, I would have refrained from describing it as new.

The ovary is 5-celled, glabrous, and after swelling at the base tapers conically into an ill-defined style similar to those found in species of *Gordonia*. The style in the bud, which I examined, was undivided. However, the collectors, *J. & M. S. Clemens*, draw attention to the five divisions of the stigma and it is possible that, like *A. Griffithii* of India and *A. lasiopetala* of Ceylon the style in open flower and fruit may be divided. The stamens, although no accurate count could be obtained, were typically those of *Adinandra* in number and character. The anthers were oblong, elongated, and bore the characteristic pubescence of the genus. The filaments also were lightly pubescent, in series, and joined for part of their length. The corolla-lobes, very tightly folded in the bud, could not be separated. However, they were glabrous and of a more thickened nature than those found in *Gordonia*. The ovules were attached to a slight placenta.

The specific name *A. quinquepartita* refers to the 5-parted stigma.

30. **Adinandra impressa,** sp. nov.

Arbor ?; ramis griseis, teretibus, glabris, ramulis teretibus brunneis, glabris, innovationibus glabris vel rare leviter pubescentibus, gemmis terminalibus conicis glabris vel rarissime leviter adpresso-pubescentibus. Folia coriacea, glabra, oblongo-elliptica vel late elliptica, 4–7 cm. longa, 2.5 4 cm. lata, apice late acuminata, basi obtusa vel late cuneata, margine integra, supra nitida, subtus pallidiora, fusco-punctata, venis supra impressis, subtus subobscuris, primariis 5–8 paribus, intra marginem anastomosantibus arcuantibusque, venis secundariis inter primarias frequentibus, petiolis circiter 5 mm. longis, glabris. Flores axillares, solitarii; pedicellis glabris, teretibus, 1.5–2.5 cm. longis; bracteolis 2, oppositis, glabris, subrotundatis, circiter 2 mm. longis et latis, margine glandulosis; sepalis 5, imbricatis, glabris, margine glandulosis, exterioribus duobus late deltoideis, 4 mm. longis, 6 mm. latis, interioribus tribus subrotundatis, circiter 5 mm. longis, 6 mm. latis; petalis 5, basi connatis, glabris, purpureis, circiter 12 mm. longis, apice acutis; staminibus circiter 25, 3-seriatis, glabris, filamentis pallidis, connatis, ad basi corollam adnatis, 3–5 mm. longis, antheris 2–3 mm. longis, glabris, rarissime setis isolatis, ovario glabro, semi-globoso, circiter 4 mm. diametro, 5-loculari, multi-ovulato, stylo glabro, circiter 5 mm. longo, apice 5-sulcato, stigmatibus 5. Fructus elongato-globosus, glaber, circiter 12 mm. longus, 8 mm. latus, 5-locularis, multi-seminatus, seminibus minutis, 1 mm. vel minus diametro, rubris.

DISTRIBUTION: British North Borneo.

BRITISH NORTH BORNEO: Upper Mt. Kinabalu, alt. 2000 5000 m., *J. & M. S. Clemens 30202* (TYPE, A), April 1932 (flowers dark with purple petals and green calyx). — Upper Mt. Kinabalu, *J. & M. S. Clemens 29073* (A), April 8, 1932 (flower-buds dark, the petals purple, the calyx green).

Like *A. quinquepartita* Kob. this species has distinctly five stigmas. The style near the apex is sulcate with five distinct ridges. Dissections were made from the bud. It is possible that in maturing the style may become five-parted. The corolla is dark purple in color, and in the bud it is very elongate-conical, extending considerably beyond the calyx. The stamens, except for a rare evidence of pubescence on the anthers, are glabrous throughout. The leaves are thick-coriaceous with impressed nerves on the upper surface. The terminal buds are generally glabrous. However, there are rare instances of pubescence on the buds and very young branchlets. In glabrosity this species rivals *A. dumosa* Jack. The mature seeds are minute, measuring a single millimeter or less in diameter, and are red in color rather than the traditional dark brown.

31. **Adinandra lasiopetala** (Wight) Choisy in Mém. Soc. Phys. Hist. Nat. Genève 1: 112 (Mém. Ternstr. 24). 1855. — Dyer in Hooker f., Fl. Brit. Ind. 1: 283. 1874. — Beddome, Fl. Sylv. 2: (Forester's Man. Bot. xxiv, t. iii, f. 3). 1874. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Trimen, Handb. Fl. Ceyl. 1: 108, pl. 9. 1893. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

Cleyera lasiopetala Wight, Ill. Ind. Bot. 1: 99. 1840.

Eurya lasiopetala (Wight) Gardner in Calcutta Jour. Nat. Hist. 7: 446. 1847.

Sarosanthera lasiopetala (Wight) Thwaites, Enum. Pl. Zeyl. 41. 1858.

DISTRIBUTION: Ceylon.

CEYLON: *G. H. K. Thwaites 775* (G).

Small tree ca. 10 m. high; branchlets terete, grayish brown, glabrous except when very young. Leaves coriaceous, oblanceolate, glabrous except when very young, 7–9 cm. long, 2–3 cm. wide, the margin serrulate, conspicuously recurved especially along the lower half of the leaf, the petiole semi-terete, flat on the upper surface, ca. 5 mm. long. Flowers axillary, solitary; pedicels somewhat recurved, ca. 1.5 cm. long, appressed-pubescent, thickened towards the apex; bracteoles 2, unequal, opposite, immediately beneath the calyx, persistent, somewhat rotund, 3–5 mm. long, finely appressed-pubescent; calyx-lobes 5, imbricate, thickened, unequal, somewhat rotund, ca. 8 mm. long, the outer lobes finely appressed-pubescent, the inner lobes sericeous on the central portion of the outer surface, the margin glabrous, membranaceous; corolla-lobes 5, white, obtuse, ca. 2 cm. long, covered on the back with dense sericeous pubescence; stamens (fide Trimen et al.) monadelphous, 18–25, filaments unequal, sparsely hairy, joined at the base, the anthers sparsely pubescent; ovary 3-celled, glabrous, attenuate at the apex into a filiform, glabrous style which, on the maturing of the fruit, becomes 3-parted, the stigma 3-parted. Fruit globose, 3-celled, fide auct., many-, small-seeded; seeds hippocrepiform.

This species is exceptional in the genus in having a 3-parted style (in the maturing fruit), and small seeds. These characteristics are similar to those found in *Cleyera*. The persistent bracteoles, the single, axillary flowers and the pubescent filaments separate it, on the other hand, from *Cleyera*.

The only specimen available for this study is *Thwaites* (C. P. 775), quite an authentic specimen since it was used by Thwaites in his treatment. It agrees perfectly, as far as the available characters are concerned, with the illustrations of Trimen. The stamens were not seen by the present author, but the statement by Dyer that they are unequal leads one to believe that some form of seriate arrangement exists. Only in a single series are the stamens usually of equal length.

32. **Adinandra dumosa** Jack in Malay Misc. 2 (7): 50. 1822 [repr. in Hooker, Comp. Bot. Mag. 1: 153. 1835; in Calcutta Jour. Nat. Hist. 4: 207. 1843; et in Miscel. Papers Indo-China, II. 2: 271. 1887]. — Choisy in Zollinger, Syst. Verz. Ind. Archip. 143. 1854; in Mém. Soc. Phys. Hist. Nat. Genève, 1: 112 (Mém. Ternstr. 24). 1855. — Miquel, Fl. Ned. Ind. 1 (2): 477. 1859; Ann. Mus. Bot. Lugd.-Bat. 4: 103. 1868. — Dyer in Hooker f., Fl. Brit. Ind. 1: 282. 1874. — King in Jour. As. Soc. Bengal, 59 (2): 188 (Mater. Fl. Malay Penin. 1: 128). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Koorders & Valeton, Meded. 'S Lands. Pl. 16: 223 (Bijdr. Boomsoort Java 3: 223). 1896. — Merrill, Enum. Born. Plts. 391. 1921. — Burkill & Holttum in Gard. Bull. Straits Settl. 3: 36. 1923. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

Adinandra Jackiana Korthals, Verh. Nat. Gesch. Bot. ed. Temminck, 106. 1840.

Adinandra trichocoryna Korthals, Verh. Nat. Gesch. Bot. ed. Temminck, 107. 1840. — Miquel, Fl. Ned. Ind. 1 (2): 477. 1859; Ann. Mus. Bot. Lugd.-Bat. 4: 103. 1868. — Merrill, Enum. Born. Plts. 391. 1921.

Adinandra cyrtopoda Miquel, Fl. Ned. Ind. Suppl. 1: 478. 1862.

Adinandra stylosa Miquel, Fl. Ned. Ind. Suppl. 1: 478. 1862.

Adinandra glabra Miquel, Fl. Ned. Ind. Suppl. 1: 479. 1862.

Adinandra trichocoryna Korthals α *parvifolia* Miquel, Ann. Mus. Bot. Lugd.-Bat. 4: 103. 1868.

Adinandra trichocoryna Korthals β *glabra* Miquel, Ann. Mus. Bot. Lugd.-Bat. 4: 103. 1868.

Adinandra trichocoryna Korthals γ *stylosa* Miquel, Ann. Mus. Bot. Lugd.-Bat. 4: 104. 1868.

Adinandra trichocoryna Korthals δ *cyrtopoda* Miquel, Ann. Mus. Bot. Lugd.-Bat. 4: 104. 1868.

DISTRIBUTION: Malay Peninsula, Netherlands East Indies, Sarawak, British North Borneo.

MALAY PENINSULA: Singapore, Bot. Garden, *J. & M. S. Clemens 22448* (NY), Nov. 7, 1929 (tree 10 m. high; flowers white). — Singapore Bot. Gard. [Cult.], lawn 1., *M. Nur 3410* (A), Oct. 12, 1925, *24975* (A), May 17, 1930. — Singapore, *H. M. Curran s. n.* (US), Aug. 1910; *O. Kuntze 6108* (NY), Oct. 1875. — Malacca, *W. Griffith s. n.* (G, M). — Perak, *B. Scortechini s. n.* (US). — Perak, near Ulu Selangore, open bamboo forest, hilly locale, alt. 150–200 m., *Dr. King's Collector 8698* (A), March 1886 (tree 15 m. high with spreading branches; leaves dark metallic green; flowers white). — Penang, Penang Hill, *G. King s. n.* (US), Aug. 1879. — Pahang, Tasek Bera, at low altitude, *M. R. Henderson 24065* (NY), Oct. 10, 1930. — Exact locality lacking, *W. Griffith 756* (G); *A. C. Maingay 184* (G).

SUMATRA: East Coast: Asahan, Masihi Forest Reserve, in primary forests, on "red" soil, *B. A. Krukoff 4255* (A, M, NY, US), Nov. 3, 1932 (tree 20 m. high). — Asahan, between Soenggapa and Pargambiran, alt. 270–360 m., *H. H. Bartlett 6696* (C, NY, US), Feb. 11, 1927. — Koealoe, old jungle near the Aek Kanopan, Loendoet Concession, *H. H. Bartlett 6989* (C, NY, US), March 19, 1927. — Asahan, between Soenggapa and Pargambiran, alt. 270–360 m., *H. H. Bartlett 8061* (NY, US), May 22, 1927. — Asahan, Bandar Poeloch, *H. S. Yates 1688* (A), *1917* (NY). — East southeast of Toba Lake, *J. A. Lorzing 6563* (A), May 11, 1919. — Bilah, general region of Morbau, near Bilah Pertama (Parbasiram), *Rahmat Si Toroes 389* (NY), Feb.-March 1928. — Koealoe, Si Toenggir, 9 km. from Damoeli, *Rahmat Si Toroes 1394* (NY), Sept. 20, 1928. — Bilah, vicinity of Rantau Parapat, *Rahmat Si Toroes 1577* (A), *2204* (A), March-May 1932 (tree). — Bilah, Aer Kandis (formerly Radja Mas), near Rantau Parapat, *Rahmat Si Toroes 2666* (A, US), May 28-June 26, 1932 (tree). — Bilah, Sigamata, near Rantau Parapat, *Rahmat Si Toroes 3125* (A, NY), June 27-July 23, 1932. — Bilah, Subdivision Laboehan Batoe, District Kota Pinang, Lannga Pajoeng, *Rahmat Si Toroes 3434* (NY, US), March 7–30, 1933. — Subdivision Laboehan Batoe, District Kota Pinang, Si Mandi Angin (on the Soengei Kanan), *Rahmat Si Toroes 4058* (A, NY, US), April-May 1933. — Subdivision Laboehan Batoe, District Bilah, Hitean Haloban (South of Concession Rantau Parapat), *Rahmat Si Toroes 4305* (US), May 17-24, 1933. Riouw en Onderh: Indragirischebovenlanden, Batang Peranap, alt. 75 m., *Neth. Ind. For. Serv. b.b. 30092* (A), Sept. 19, 1939. Tapanoeli: Habinsaran, Panapparan to Maranti, *H. H. Bartlett 8037* (NY, US), May 16–19, 1927. — Road from East Coast to Tapanoeli, northeast of Toba Lake, new road near Peso Peso, virgin jungle, alt. 1350–1500 m., *W. N. & C. M. Bangham 1162* (A, NY), Feb. 22, 1932 (tree 8 m. high; flowers white). — Division Padang Si Dimpoean, Subdivision Padang Lawas, Sosopan on Aek Si Olip, *Rahmat Si Toroes 5518* (A, NY), Sept. 1933. West Coast: "?Sankor," *J. E. Teysmann s. n.* (G). — "?Sibogne," *J. E. Teysmann s. n.* (G). Exact locality missing: *P. W. Korthals s. n.* (probable ISOTYPE of *A. Jackiana,* G, NY). — *H. O. Forbes s. n.* (G).

JAVA: *J. E. Teysmann s. n.* (probable ISOTYPES of *A. cyrtopoda,* G, NY), 1868. — *Herb. Hort. Buitenzorg* [Cult.] *137* (*VI–c–203, 205, 205A*) (US).

BORNEO: *J. E. Teysmann s. n.* (probable ISOTYPE of *A. stylosa,* G). — *P. W. Korthals s. n.* (probable ISOTYPE of *A. trichocoryna,* G, NY).

BRITISH NORTH BORNEO: Mt. Kinabalu, Mt. Nunkok, alt. 1650 m., *J. & M. S. Clemens 32724* (A), April 15, 1933. — Mt. Kinabalu, Colombon River, alt. 1350 m., *J. & M. S. Clemens 34005* (A), July 21, 1933. — Sandakan and vicinity, *D. D. Wood 810* (A, PBS), *887* (A, PBS), March-June 1920. — Sandakan and vicinity, *M. Ramos 1549* (A, G, US), Sept.-Dec. 1920.

SARAWAK: Mount Matang, alt. 200 m., *J. & M. S. Clemens 22321* (A, M). — Mt.

Dulit, moss-forest, alt. ca. 1000 m., *P. W. Richards 1620* (A), Sept. 8, 1932 (shrub 3 m. high; petals white, the calyx pinkish; leaves thick and leathery).

Small trees with dark brown bark; branchlets terete, glabrous even to the current year's growth, the terminal buds glabrous, only very rarely sparsely pubescent. Leaves coriaceous, elliptic-oblong, 6–10 cm. long, ca. 4 cm. wide, usually obtuse at the apex with an obtuse acumen, tapering at the base into a short petiole, the mature leaves glabrous on both surfaces, very rarely the under surface of the very young leaves lightly pubescent along the midrib, the margin entire or obsoletely serrulate, the veins obscure, the petiole ca. 5 mm. long, glabrous. Flowers axillary, solitary, rarely in twos; pedicel up to 1.5 cm. long, glabrous, accrescent towards the apex; bracteoles 2, persistent, opposite, immediately below the calyx, coriaceous, glabrous, subrotund, unequal, 3–4 mm. long, ca. 3 mm. wide, the margin entire or slightly fimbriate; calyx-lobes 5, imbricate, glabrous, broadly ovate, unequal, 7–8 mm. long, 6–7 mm. wide, thickened at the center, the margin scarious, usually entire, occasionally slightly fimbriate; corolla-lobes 5, connate at the base for 3–5 mm., glabrous, white, obovate, up to 16 mm. long, 6–7 mm. wide, bluntly acuminate at the apex; stamens ca. 40, seriate, 9–12 mm. long, the filaments 5–8 mm. long, adnate to the base of the corolla, accrescent towards the apex, densely pubescent, the anthers ca. 4 mm. long, hirsute, the apicule 0.5–1 mm. long, densely pubescent; ovary glabrous, subconical, ca. 4 mm. long, 5 mm. diam., occasionally furrowed, tapering at the apex into a glabrous style, 5-celled, multi-ovulate. Fruit globose, glabrous, 5-celled, many-seeded.

Adinandra dumosa, described by Jack in 1822, is the original species of the genus and possesses the widest range of distribution of any of the Indo-Malayan species. It holds the same position in the Indo-Malayan distribution that *A. Millettii* holds in the Eastern Asiatic distribution. The center of distribution for the species appears to be the island of Sumatra, the range extending northward into Malaya and down through the East Indian Islands into Java and Borneo.

It is probably the most nearly glabrous species in the genus. Even the terminal buds and current year's growth of the branchlets are glabrous. Species of *Adinandra* are often termed glabrous when close observation shows that the terminal buds and current year's growth of branchlets are quite pubescent. As is usual in species of this family, one will find exceptions to the general rule. Specimens collected on the east coast of Sumatra near Bilah have a tendency toward pubescence. A fine scattered spreading pubescence, not too noticeable but enough to be exceptional, may be found along the midrib on the under surface of the leaves. However, the unfolding buds are still quite glabrous since the dorsal surface of the leaf is exposed while unfolding. In the pubescent bud the obvious pubescence is on the dorsal surface of the leaf, which character is quickly dissipated and entirely lost in maturity.

The leaves vary considerably in size and shape. Generally they are bluntly acuminate. Occasionally one finds leaves tapering into a fine acumen. The stamens are numerous with both the anthers and filaments densely pubescent. In the latter case, the pubescence is so dense that it

is difficult to separate the filaments in dissection. This dense pubescence on the filaments in so glabrous a species is surprising. The style develops considerably in fruit, rivaling, at times, the pedicel in length. The bracteoles, always persistent, are small, rounded and spreading. Occasionally, in the very young flower-buds, the bracteoles are lightly appressed-pubescent.

In this study, I have had opportunity to examine authentic material, perhaps isotypes, of *A. Jackiana*, *A. trichocoryna*, *A. cyrtopoda*, *A. stylosa* and *A. glabra*, and find no suitable characters worthy of specific separation. All these names have been listed above as synonyms of *A. dumosa*.

VERNACULAR NAMES: *Kajoe aling, kajoe si mar apiapi, kajoe apiapi, apiapi, daun saribu.*

33. **Adinandra verrucosa** Stapf in Hooker's Icon. Pl. 23: t. 2266. 1893; in Trans. Linn. Soc. Bot. II. 4: 133 (Fl. Mt. Kinabalu). 1894. — Merrill, Enum. Born. Plts. 391. 1921. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: British North Borneo.

BRITISH NORTH BORNEO: Mt. Kinabalu: Paka Cave to Lobang, *M. S. Clemens 10735* (TOPOTYPES, A, PBS), Nov. 15, 1915 (flowers pink). — Upper Kinabalu, alt. 2000-4000 m., *J. & M. S. Clemens 29113* (A), March 27, 1932 (flowers pale pink suffused with white). — Head Kinatak, along margin of open place, alt. ca. 3000 m., *J. & M. S. Clemens 33121* (A), Feb. 27, 1933 (small tree 8 m. high; flowers green and pink; fruit purplish green).

Tree ca. 10 m. (fide Clemens) high; branchlets terete, glabrous, sturdy, noticeably thicker than those of most other species, verrucose-lenticellate, the terminal buds glabrous except for very light pubescence at the apex, the margin ciliate, otherwise glabrous. Leaves thick-coriaceous, oblong-elliptic, 12–15 cm. long, 5–6 cm. wide, obtusely emarginate at the apex, somewhat rounded at the base, glabrous on both surfaces, dark-punctate beneath, the midrib conspicuous beneath, bisulcate (in dried specimens), the veins inconspicuous on both surfaces, the margin quite entire with only occasional sharp denticulations, the petiole thick, sturdy, glabrous, usually 7–8 mm. long, sometimes only 4 mm. long. Flowers axillary, solitary or in twos or threes; pedicel sturdy, glabrous, seldom over 5 mm. long, often as thick as long; bracteoles 2, persistent, glabrous, opposite, immediately below the calyx, rounded, 3–4 mm. long and wide; calyx-lobes 5, imbricate, glabrous, rounded, 6–8 mm. long; corolla-lobes 5, glabrous, pale rose or pink suffused with white (Clemens), broadly ovate-elliptic, contracted noticeably at the base, 16–20 mm. long, 10–12 mm. wide; stamens apparently 4- or even 5-seriate, 20–24, apiculate, the filaments joined nearly their entire length, varying in length from the shorter or inner series, 7–8 mm. long, to the longer or outer series, ca. 13 mm. long, densely appressed-sericeous (silvery white) pubescent on the upper half of the dorsal surface, sparsely or occasionally pubescent on the lower half, the anthers oblong, uniformly ca. 5 mm. long, densely sericeous on the dorsal surface; ovary somewhat ovoid, ca. 4–5 mm. diam., glabrous, 5-celled, multi-ovulate, tapering rather abruptly into a thickened glabrous style, ca. 1.5 cm. long. Fruit globose, glabrous, ca. 1 cm. or more diam. Seeds many, minute, shining subreniform.

From the specimens examined and from the literature concerning *A.*

verrucosa, it appears that this species is confined to the "Upper Mountain-Zone" of Mt. Kinabalu, North Borneo. According to Stapf the altitude range of this zone is "6000–10000" feet.

Except for the pubescence on the stamens, this species is entirely glabrous. The sturdy character of all parts of the plant is the first feature which impresses one. However, the verrucose-lenticellate character of the young branchlets, the very short and thick pedicels, the bisulcate midrib (lower leaf surface) and the thick leaves and petioles are other features which tend to distinguish the species from most of the other near relatives.

34. **Adinandra colombonensis**, sp. nov.

Arbor ?; ramis griseis vel griseo-brunneis, glabris, teretibus, ramulis brunneis, glabris, teretibus, innovationibus adpresso-pubescentibus. Folia subcoriacea vel chartacea, elliptica, 6–10 cm. longa, 3–4 cm. lata, apice gradatim attenuata vel rare abrupte acuminata, basi gradatim cuneata, supra glabra, subtus glabra vel leviter adpresso-pubescentia, margine integra vel undulata, venis supra obscuris, subtus primariis 8–10 paribus juxta marginem arcuantibus, venis secundariis inter primarias frequentibus, petiolis 2–3 mm. longis, glabris vel leviter pubescentibus. Flores axillares, solitarii; pedicellis teretibus, 2 cm. longis, adpresso-pubescentibus; bracteolis 2, oppositis, persistentibus, leviter adpresso-pubescentibus, subdeltoideis, circiter 1.5 mm. longis; sepalis 5, imbricatis, adpresso-pubescentibus, margine ciliolatis, exterioribus duobus late ovatis circiter 5 mm. longis, 6 mm. latis, interioribus tribus ovatis, 5–7 mm. longis, 4–5 mm. latis, margine scariosis; petalis 5, albidis, glabris, basi 5 mm. connatis, circiter 15 mm. longis, 5–6 mm. latis, apice subrotundatis; staminibus circiter 40, 8–13 mm. longis, 4-seriatis, filamentis hirsutis, liberis, basi ad corollam adnatis, 5–9 mm. longis, antheris brunneis, elongatis, 3–5 mm. longis, hirsutis, ovario glabro, subgloboso, 5-sulcato, 5-loculari, multi-ovulato, stylo glabro, circiter 12 mm. longo. Fructus non visi.

DISTRIBUTION: British North Borneo.

BRITISH NORTH BORNEO: Mt. Kinabalu, Colombon basin, alt. 1500 m., *J. & M. S. Clemens 34237* (TYPE, A), Aug. 2, 1933 (flowers white with brown anthers). — Mt. Kinabalu, Colombon River, alt. 2000 m., *J. & M. S. Clemens 33770* (A), June 28, 1933 (flower-buds cream-colored).

This species is closely related to *A. caudatifolia* Kob., but is separated by the 5-celled ovary and many ovules. It is safe to assume that in fruit *A. colombonensis* will produce many seeds. This assumption can be drawn from the size and number of ovules in the ovary.

35. **Adinandra excelsa** Korthals, Verh. Nat. Gesch. Bot. ed. Temminck, 109. 1840. — Miquel, Fl. Ned. Ind. 1 (2): 477. 1859; Ann. Mus. Bot. Lugd.-Bat. 4: 103. 1868. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Stapf in Trans. Linn. Soc. London 4: 133 (Fl. Mt. Kinabalu). 1894. — Merrill, Enum. Born. Plts. 391. 1921. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Borneo, British North Borneo.

BORNEO: Exact locality lacking, *P. W. Korthals s. n.* (probable ISOTYPE, G, NY). BRITISH NORTH BORNEO: Mt. Kalawat, trail, *M. S. Clemens 11168* (P.B.S.), Dec. 10–11, 1915 (small tree with white flowers and green fruit).

Tree ca. 10 m. high; branches and branchlets brownish, terete, glabrous, the terminal buds elongate-conical, densely sericeous-pubescent. Leaves

coriaceous, oblong-ovate, 9–15 cm. long, 4–6.5 cm. wide, somewhat acute or shortly oblong-acuminate at the apex, rounded or obtuse at the base, glabrous on both surfaces, punctate-dotted beneath, obsoletely serrulate at the margin, the veins (up to 12 pairs) conspicuous on both surfaces, arching upward near the margin, the petiole semi-terete, flat above, glabrous, 0.5–1 cm. long. Flowers axillary, solitary; pedicels thin, 2–3 cm. long, glabrous, swelling noticeably above the longer bracteole into the calyx; bracteoles 2, persistent, alternate below the calyx, unequal, deltoid to subrotund, minute, 1.5–2 mm. long, glabrous; calyx-lobes 5, imbricate, coriaceous, subequal, subrotund, ca. 7 mm. long and wide, glabrous; corolla-lobes 5, connate at the base, oblong, obtuse at the apex, fleshy, glabrous, ca. 12 mm. long, 6 mm. wide, white; stamens many, several-seriate, the filaments linear, glabrous, joined at the base, the anthers oblong, densely hirsute; ovary glabrous, somewhat conical, 5-celled, multi-ovulate, tapering at the apex into a glabrous style. Fruit globose, glabrous, 5-celled, many-seeded, attenuate at the apex into a persistent style.

According to Stapf, this species may be found in Sumatra. Only material from Borneo was available for study and this material contained little more than four probable isotypes.

Adinandra excelsa appears very closely allied to the type-species *A. dumosa*, but can be distinguished by the sericeous buds, the alternate bracteoles, glabrous and subdeltoid, and the glabrous filaments.

Distinguishing characters are: (1) the glabrous ovary and fruit; (2) leaves glabrous on both surfaces but sericeous in bud; (3) glabrous calyx-lobes and corolla-lobes; (4) glabrous, deltoid, alternate persistent bracteoles; and (5) glabrous filaments.

Koorders describes the ovary as single-celled. However, dissections have shown it to be distinctly five-celled and multi-ovulate. The fruit is clearly five-celled also.

36. **Adinandra polyneura,** sp. nov.

Arbor ?; ramis teretibus, glabris, griseo-brunneis; ramulis teretibus, glabris, rubro-brunneis; gemmis terminalibus elongatis, luteo-adpresso-pubescentibus. Folia coriacea, oblongo-elliptica vel oblongo-obovata, apice gracili-acuminata, basi attenuata, supra glabra, subtus glabra vel glabrescentia, rariter leviter adpresso-pubescentia, fusco-punctata, margine subintegra vel crenulata, venis lateralibus primariis 20+ paribus, ad marginem non arcuantibus sed reticulatis, petiolis glabris, ut videtur circiter 1 cm. longis. Flores axillares, solitarii; pedicellis glabris, 1–1.5 cm. longis subcostatis; bracteolis 2, persistentibus, subopppositis, subdeltoideis vel late ovatis, glabris, circiter 3 mm. longis, 4 mm. latis, costatis; sepalis 5, imbricatis, glabris, subaequalibus, subrotundatis vel late ovatis, 8–9 mm. longis et latis, margine ciliolatis vel glandulosis; petalis 5, basi connatis, oblongo-obovatis, 17–20 mm. longis, 9–10 mm. latis, apice rotundatis, exteriore adpresso-pubescentibus, margine scariosis; staminibus 30–35, 3-seriatis, 10–14 mm. longis, filamentis 5–8 mm. longis, basi connatis, ad corollam adnatis, dense hirsutis, antheris elongatis, 5–6 mm. longis, dense hirsutis; ovario subgloboso, glabro, 5–6 mm. diametro, 5-loculari, multi-ovulato, stylo glabro, circiter 13 mm. longo, basi circiter 3 mm. diametro.

DISTRIBUTION: Netherlands East Indies (Sumatra).

SUMATRA: West Coast, Pajacombo Oeloe Air, alt. ca. 1100 m., *Netherlands For. Expt. Station b.b. 5173* (TYPE, K, fragment, A), July 7, 1922.

The leaves of this new species resemble very much those of *A. myrioneura* Kob., and *A. borneensis* Kob. both of Borneo, in the large number of veins. In *A. myrioneura*, however, the corolla is glabrous, the bracteoles caducous, and the calyx, ovary and style pubescent. In *A. polyneura* the corolla is pubescent, the bracteoles persistent, and the calyx, ovary and style glabrous. In *A. borneensis* the bracteoles are caducous and the calyx is pubescent.

The petioles of the leaves of *A. polyneura* appear to be rather outstanding in that they seem to measure over a centimeter in length. This apparent length is caused by the gradual tapering of the blade along the petiole in a slight wing-formation. The actual petiole hardly exceeds in length that of the majority of species in this genus.

Another interesting feature is the slight keel on the dorsal surface of the bracteole. Also, the pedicel appears 2-ridged, caused by the decurrence of the bracteole to the base, very much as a stem with decurrent leaves.

VERNACULAR NAME: *Madang limbe.*

37. **Adinandra angulata** Ridley in Jour. Linn. Soc. Bot. 38: 304. 1908; Fl. Malay Penin. 1: 195. 1922. — Melchior in Nat. Pflanzenfam. ed. 2, **21**: 144. 1925.

DISTRIBUTION: Malay Peninsula (Pahang).

MALAY PENINSULA: Pahang: Gunong Tahan, alt. 1700–1800 m., *L. Wray & H. C. Robinson 5518* (TYPE, K), July 12, 1905 (tree 12–16 m. high).

Tree 12–18 m. high; branches rough, sturdy, grayish brown, glabrous, 4-angled, lightly winged, the young branchlets conspicuously winged, glabrous, thick, as much as 5 mm. in diameter, the terminal buds sericeous. Leaves thick-coriaceous, elliptic, 10–15 cm. long, 5–7 cm. wide, obtusely acuminate to subrotund at the apex, acute at the base, glandular-apiculate along the margin from the base to the apex, less conspicuously so near the base, glabrous on both surfaces, the veins conspicuous on both surfaces even to the fine reticulations, 8–9 pairs arcuate-ascending near the margin, interspersed with an equal number of secondary veins, nearly as conspicuous but not as long, the petiole thick, glabrous, ca. 1 cm. long, ca. 4 mm. in diameter. Flowers in pairs, presumably axillary (none attached); pedicels in pairs, sturdy, up to 5 cm. long, glabrous, flattened, ca. 1 mm. in diameter at the base, accrescent to 5 mm. in diameter at the apex, the narrow edges terminating in the bracteoles; bracteoles 2, small, almost vestigial, persistent, unequal, subdeltoid, subopposite, the lower bracteole 1+ mm. long, the upper bracteole 2+ mm. long; calyx-lobes 5, imbricate, rounded, glabrous, ca. 7 mm. long, 8 mm. wide; corolla-lobes (bud) 5, glabrous, ca. 12 mm. long, 6 mm. wide, thick, almost woody in texture; stamens (bud) ca. 35, seemingly 4-seriate, 6–7 mm. long, the filaments joined at the base, glabrous, the longer filaments equalling the anthers in length, the anthers hirsute; ovary glabrous, hemispherical, tapering at the apex into a glabrous style, 3-celled, two cells normal, one cell compressed, ovules few. Fruit globose, glabrous, ca. 1.5 cm. in diameter, 3-celled, few-seeded, 1–2 seeds per cell. Seeds few, large, 8–9 mm. long, 6–7 mm. across, flattened, dark, lustrous.

The branches and branchlets in this species are angled and winged. This character, along with the thick, conspicuously veined leaves, the long

thick pedicels (5 cm. long) in pairs, and the large seeds makes this species one of the most outstanding in the genus.

Ridley, in his original description, referred to the flowers as "Flores non visi." However, buds were available for dissection. Considering the size of the seeds, so few in number, and the irregularity in the cells of the fruit, I felt compelled to dissect one of the few buds accompanying the type to prove to myself that this species belonged to the genus *Adinandra*.

In the fruit, I found three cells, two of which were larger than the third and occupied most of the fruit. The third cell was compressed along the wall of the fruit and was seedless. The two large cells contained only three seeds between them. These seeds were three times the size normally found in the genus, very uniformly scrobiculate and typical of *Adinandra*. In the ovary of the flower-bud, the same condition existed, namely two large cells and one smaller cell. The ovules, few in number, in the bud-stage were as large or larger than the mature seeds in most other species of the genus.

Otherwise, characters in the flower-bud appeared to be typical for the genus. The stamens numbered about 35, possessed hirsute anthers which were quite uniform in size and equalled the longest filaments in length. The corolla-lobes seemed thick in texture.

On paper, this species is difficult to separate from *A. Sarosanthera*. In most instances, *A. Sarosanthera* has terete branchlets. However, in rare cases in the species, one finds definitely angled branchlets, but not as pronounced as in *A. angulata* where it appears to be the dominant character, extending to the branches themselves.

Both species have 3-celled ovaries, not so well defined in *A. angulata*, and both have few but large seeds developing in the fruit. In both species the pedicels are elongated, somewhat flattened, and the bracteoles are quite minute. In *A. angulata* the veins are very prominent on both surfaces with almost equally pronounced reticulations. The bracteoles are quite deltoid and occasionally apiculate. In *A. Sarosanthera* the veins are obscure on the upper surface, only lightly conspicuous beneath, and the bracteoles are rounded.

A second related species is *A. laotica* Gagnepain from Laos, Indo-China. In the latter species the ovary and fruit are 5-celled and the bracteoles are caducous.

38. **Adinandra Sarosanthera** Miquel, Fl. Ned. Ind. 1 (2): 477. 1859; Ann. Mus. Bot. Lugd.-Bat. 4: 104. 1868. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Merrill, Enum. Born. Plts. 391. 1921; in Univ. Calif. Publ. Bot. 15: 198. 1929, as "*sarcosanthera*." — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

Sarosanthera excelsa Korthals, Verh. Nat. Gesch. Bot. ed. Temminck 104. 1840.

Adinandra lamponga Miquel, Fl. Ned. Ind. Suppl. 1: 479. 1862; Ann. Mus. Bot. Lugd.-Bat. 4: 104. 1868. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893, as "*lampango*." — Koorders & Valeton, Meded. 'S Lands. Pl. 16: 220 (Bijdr Boomsoort. Java 3: 220). 1896. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

Adinandra macrantha Teijsmann & Binnendijk in Tijdschr. Ned. Ind. 25: 421. 1863. — King in Jour. As. Soc. Bengal 52 (2): 191 (Mater. Fl. Malay Penin. 1: 131). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Ridley, Fl. Malay Penin. 1: 195. 1922.

Adinandra leiopetala Miquel, Ann. Mus. Bot. Lugd.-Bat. 4: 104. 1868. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: British North Borneo, Netherlands East Indies (Borneo, Java, Sumatra), Malay Peninsula (Johore, Perak, Pahang).

BRITISH NORTH BORNEO: Elphinstone Prov., Tawao, *A. D. E. Elmer 21629* (A, C, M), *21727* (C, G, M, NY), Oct. 1922-March 1923.

BORNEO: Exact locality lacking, *P. W. Korthals s. n.* (probable ISOTYPE, G). JAVA: Cult. Bot. Gard. Buitenzorg, no. *VI. c. 6.* (G, NY, US), 1903. SUMATRA: Atjeh en Ond. Gajo Loeëus, Penosan (Gn. Bohgane & Rangoet Galang), alt. ca. 1800–1900 m., *Neth. Ind. For. Serv. b.b. 22381, 22391, 22400* (A) Feb. 1–3, 1937. — East Coast, vicinity of Aek Moente (Aer Moette), Asahan (northeast of Tomoean Dolok and west of Salabat), alt. ca. 500 m., *Rahmat Si Boeea 9132* (A), Jan.-July 1936. — Palembang, Banjoesin en Koeboestreken, *A. Thorenaar 111* (A), July 14, 1911. — Palembang, Lementang Ilir, Semangoes, *Neth. Ind. For. Serv. b.b. 32125* (A), June 27, 1940. — Lampong, *J. E. Teysmann s. n.* (G). — Exact locality lacking, *H. O. Forbes 3191* (G).

MALAY PENINSULA: Perak: Sungei Krian Estate, at sea level, *G. H. Spare 36003* (A). Johore: Bagan Liman, Sedili River, at low alt., *E. J. H. Corner 23896* (NY), Feb. 18, 1931. — Sungai Sedili, *E. J. H. Corner 25992* (NY), Aug. 28, 1932 (large tree 17 m. high). — Kangka Sedili Kechil, at low alt., *E. J. H. Corner 28581* (A, NY), June 18, 1934. — Sungai Kayu, Mawai-Jemuluang Rd., in swampy forest, at low alt., *E. J. H. Corner 28728* (A), Feb. 5, 1935. Pahang: Sungai Bera, near Tasek Bera, at low alt., *M. R. Henderson 24113* (NY).

Tree 25–30 m. high; branchlets brown, glabrous, appressed-pubescent when very young, the buds densely sericeous. Leaves coriaceous, oblong-elliptic, 9–12 cm. long, 4–5 cm. wide (often much larger, 15–18 cm. long, 6.5–7 cm. wide), obtusely acuminate at the apex, narrowed at the base, the lower portion of the margin entire, the upper part finely serrulate, glabrous when mature (thinly appressed-pubescent beneath when immature), the midrib conspicuous, the primary veins numerous, evenly spaced, conspicuous on both surfaces, the petiole short, 5 mm. or less, somewhat winged on the upper surface, lower surface semi-terete. Flowers axillary, usually solitary, occasionally in twos; pedicel long, 3–4.5 cm., glabrous, quite erect, often nodding at the apex, the bracteoles 2, minute, quite rounded, opposite or slightly alternate below the calyx; calyx-lobes 5, somewhat coriaceous, imbricate, glabrous, varying from 5 × 6 mm. (outer lobes) to 8 × 12 mm. (inner lobes), the outer lobes weakly glandular-denticulate along the margin, the inner lobes with a membranous margin but no denticulations; corolla-lobes 5, obovate, 1.5–1.7 cm. long, glabrous or thinly pubescent on the external surface near the apex; stamens 30–50, up to 4-seriate, adnate to the base of the corolla, the filaments unequal in length, united, glabrous or nearly so, short (1–3 mm.), the anthers oblong, brownish, pubescent; ovary variable in pubescence, sometimes quite glabrous, pubescent at the apex, just below the style, or pubescent throughout, tapering at the apex into the style, 3-celled, several-ovuled. Fruit globose, up to 2 cm. in diameter, glabrous or glabrescent, with a few straggling hairs at the apex, 3-celled, seldom over 6 seeds in a single locule, sometimes only 6 in the entire fruit. Seeds flat, hippocrepiform, up to 8 mm. long.

This species was originally described by Korthals (1840) under the genus *Sarosanthera* as *S. excelsa*. Later, Miquel rightfully transferred the genus to *Adinandra*. Since the species *A. excelsa* Korthals already existed Miquel selected the name *A. Sarosanthera* as most suitable.

The distinguishing characters of this species are: (1) 3-celled pubescent ovary (usually completely pubescent, occasionally pubescent near the apex only and rarely completely glabrous); (2) large globose fruit (up to 2 cm. diam.), glabrescent, 3-celled or incompletely so, with large seeds up to 8 mm. in diameter (2 or 3 to a cell); (3) filaments glabrous or nearly so with occasional appressed hairs on the exterior surface; (4) styles glabrous; (5) calyx-lobes glabrous; (6) corolla-lobes glabrous; (7) primary veins many (ca. 20 pairs) evenly spaced and quite scalariform in appearance; and (8) pedicel 3–4.5 cm. long.

This species is nearly as widespread as *A. dumosa* Jack, extending from Borneo through Sumatra and some of the smaller East Indian islands up into the Malayan Peninsula.

In Borneo it has been referred to as *A. Sarosanthera* (and rightly so) by students of that island flora. In Sumatra, workers have called it *A. lamponga* and on the Malayan Peninsula it has been known as *A. macrantha*. The last two names have been combined before. Koorders and Valeton (1896) suggested the very close relationship among the three and felt that they should be combined under a single species.

In a species as widespread as this, and especially in this family, one must expect considerable variation. The ovary, in authentic material from Sumatra, is extremely variable. Material collected by *J. E. Teysmann s. n.* from Lampong in southern Sumatra, the type-locality of *A. lamponga*, presents a pubescent ovary. *Rahmat Si Boeea 9132* collected on the east coast of Sumatra near Asahan also has a pubescent ovary. *Thorenaar 111* and *Neth. Ind. For. Serv. b.b. 32125* collected near Palembang, Sumatra, both in fruit, show the ovary to have been pubescent because, although glabrescent in maturity, there are vestiges of pubescence at the apex. *Forbes 3191* collected in Sumatra (the locality unknown to me), has a glabrous ovary. Cultivated in the Botanical Garden at Buitenzorg, Java, under the number (VI–c–6), is a specimen with a distinctly glabrous ovary. From British North Borneo *Elmer 21629* in mature fruit seems to be quite glabrous and one may assume that the ovary was glabrous or nearly so in the flowering stage. A Korthals specimen from Borneo labeled *A. Sarosanthera* has flowers with the ovary distinctly glabrous.

Apropos of this discussion of pubescence, Koorders & Valeton in their discussion of *A. lamponga* (see reference above), stated that their description was drawn up according to specimens in the herbarium of Koorders. They stated further that the living authentic specimen of *A. macrantha* [Hort. Bog. VI–c–6] examined by them was identical with *A. lamponga* and they united the two species under *A. lamponga* after comparison of *A. macrantha* with an authentic specimen [*A. lamponga*] in "Herb. Bogor." and with the description by Miquel with which it appeared to them to agree fully. Only in the Sumatran specimen was the ovary truly pubescent. In Koorders' specimen the ovary was pubescent only at the apex. Koorders & Valeton stated that some specimens from Djampang-Koelòn (*Herb. Kds. 8159β*) differed through an entirely glabrous ovary and much

larger fruit 2.5 cm. × 2 cm. with the fruit walls 4 mm. thick. As for the leaves, the description of *A. leiopetala* Miquel agreed better with their specimen than that of *A. lamponga*. In the specimen of Teysmann in Herb. Hort. Bog., however, the leaves agree with the description of *A. leiopetala* in the projecting base. Koorders & Valeton also feel that both species are very nearly related to *A. Sarosanthera* Miq.

I have vacillated considerably in my attitude concerning this species, going so far as to attempt to write them up separately. However, my final conclusion is that the whole group should be combined under a single species, *A. Sarosanthera* Miq., even though the variation, especially in the pubescence of the ovary, is considerable.

In a few of the specimens, particularly those collected by E. J. H. Corner in Johore, the young branchlets are quite noticeably angled. From the size of the leaves and branchlets, especially *Corner 28581*, I feel further that the specimens must have been collected from very vigorous young shoots.

39. **Adinandra cordifolia** Ridley in Kew Bull. Misc. Inform. 1938: 173. 1938.

DISTRIBUTION: Sarawak, British North Borneo.

SARAWAK: Kuching, *G. D. Haviland* (= *b. p. r. c.*) *K. S.* = *23* (ISOTYPE, G), Sept. 19, 1892. BRITISH NORTH BORNEO: Mt. Kinabalu: Tenompak, alt. 1650 m., *J. & M. S. Clemens 29929* (A), June 8–11, 1932 (flower-buds opening white, the flowers with pure white petals and brown stamens). — Marai Parai, Upper Kinataki Gorge, alt. 1800 m., *J. & M. S. Clemens 32434* (A), March 29, 1933 (tree 20 m. high; flowers cream-colored). — Marai Parai, head of the Sadikan River, alt. 2000 m., *J. & M. S. Clemens 32863* (A), April 22, 1933 (tree 7 m. high; buds gray).

Tree up to 20 m. high; branchlets terete, brown, glabrous, the very young branchlets appressed-pubescent, the terminal buds conical, appressed-pubescent. Leaves coriaceous, oblong-elliptic, 11–20 cm. long, 5–8 cm. wide, acuminate or obtusely acuminate at the apex, unequally cordate at the base, glabrous (the lower surface of the very young leaves pubescent), the margin recurved, entire or nearly so, the veins 10–12 pairs, conspicuous on the lower surface, the petiole thick, very brief, 2–3 mm. long, occasionally subsessile. Flowers axillary, solitary or in pairs; pedicel thick, sericeous, ca. 5 mm. long; bracteoles 2, persistent, coriaceous, opposite, immediately below the calyx, sericeous, unequal, the smaller one ca. 3 mm. long, 4 mm. wide, rounded, the larger one ca. 6 mm. long, 8 mm. wide; calyx-lobes 5, imbricate, sericeous, unequal, broader than long, the outer lobes larger, ca. 12 mm. long, 18 mm. wide, ca. 2 mm. thick at the base, the inner lobes ca. 8 mm. long, 9 mm. wide, the margin scarious; corolla-lobes 5, connate at the base, oblong, glabrous, ca. 20 mm. long, 10 mm. wide, rounded at the apex; stamens ca. 40, 2- or 3-seriate, 11–17 mm. long (in a single flower), the filaments 7–11 mm. long, connate at the base, adnate to the base of the corolla, lightly pubescent, at least on the upper half, the anthers oblong, ca. 5 mm. long, merely lightly pubescent, some appearing glabrous; ovary sericeous, subglobose, ca. 4 mm. diam., 5-celled, multi-ovulate, the style ca. 13 mm. long, sericeous at the base, otherwise glabrous. Fruit not seen.

The large cordate leaves and the very large flowers are the outstanding characters in this species. The Clemens material cited above made

possible very essential additions to Ridley's original description. The ovary is 5-celled and multi-ovulate; the style 13 mm. long and glabrous except at the base; the stamens are unusually long with the anthers only slightly and intermittently lightly pubescent; the corolla-lobes are glabrous and up to 20 mm. long; the calyx-lobes are broader than long, sericeous, the outer larger than the inner. Ordinarily, the inner lobes are the larger.

39a. **Adinandra cordifolia** var. **strigosa**, var. nov.

Arbor; ramis teretibus, brunneis dense adpresso-pubescentibus, ramulis juventute dense flavo-sericeis, gemmis terminalibus, conicis, dense flavo-sericeis. Folia crasso-coriacea, elliptico-oblonga vel elliptica, 18–21 cm. longa, 11–12 cm. lata, apice abrupte acuminata, basi inaequilateralia, subcordata, supra nitida, glabra, subtus dense pallido-pubescentia, margine ut videtur integra, venis primariis 18–20 paribus, subtus conspicuissimis, intra marginem anastomosantibus, venis secundariis inter primarias frequentibus, petiolis minutis, ca. 1–2 mm. longis, dense pubescentibus, vel rariter subsessilibus. Flores non visi. Fructus juvenes axillares, solitarii; pedicellis ca. 1 cm. longis, teretibus, dense fulvo-pubescentibus, recurvatis; bracteolis 2, oppositis, persistentibus, pubescentibus, subrotundatis, inaequalibus, circiter 3 × 4 mm. et 5 × 6 mm.; sepalis 5, imbricatis, subrotundatis, dense adpresso-fulvo-pubescentibus, inaequalibus, circiter 8–10 mm. longis, 7–11 mm. latis; ovario elongato-globoso, sericeo, 5-sulcato, 5-loculari, multi-ovulato; stylo circiter 1 cm. longo, glabro basi excepto.

DISTRIBUTION: British North Borneo.

BRITISH NORTH BORNEO: Mt. Kinabalu: Dallas, alt. 1000 m., *J. & M. S. Clemens 26229* (HOLOTYPE, A), Aug. 21, 1931. Upper Mt. Kinabalu, Penibukan, west ridge, jungle, alt. 1350 m., *J. & M. S. Clemens 40774* (A), Oct. 18, 1933 (tree).

The main difference between *A. cordifolia* and its variety *A. cordifolia* var. *strigosa* lies in the permanence of the pubescence. Both entities are pubescent in the terminal bud, the very young unfolding leaves, and the young branchlets. In the species this pubescence appears to be very evanescent, the leaves and older branchlets shortly becoming quite glabrous or glabrescent. In the variety, the disappearance of the pubescence is less rapid. In branchlets showing growth of over a single year and in the mature leaves a dense strigose pubescence, perhaps permanent, is found.

Because of this very apparent difference one is inclined at first to consider the two as separate species. However, when an accurate appraisal of all parts has been made, the persistence of this pubescence seems to be the single basis of separation.

In the type, *J. & M. S. Clemens 26229*, the young fruits are subtended by calyces similar in size to those of the species. However, in *J. & M. S. Clemens 40774*, the second specimen cited, the calyx-lobes are somewhat smaller, measuring ca. 8 mm. in length.

40. **Adinandra subsessilis** Airy-Shaw in Kew Bull. Misc. Inform. 1939: 505. 1939.

DISTRIBUTION: Sarawak.

SARAWAK: Mt. Dulit, on steep slope of rain-forest, alt. 700–900 m., *Native Collector* (*P. W. Richards* no. *1958*) (A, ISOTYPE), Sept. 19, 1932 (small tree with "whitish" petals).

Small tree; branchlets terete, brownish, later glabrescent, the very young branchlets pilose, the buds sericeous. Leaves chartaceous or subcoriaceous, elliptic-oblong to oblong-ovate, 5–11 cm. long, 1.5–3.5 cm. wide, distinctly acuminate at the apex with the acumen nearly 2 cm. long, narrowed at the base, occasionally subrotund, the margin subentire, minutely glandular-serrulate, glabrous on the upper surface, appressed-pubescent beneath, later glabrescent, the midrib lightly impressed above, prominent beneath, pubescent, the veins 12–14 pairs prominent on both surfaces, arching upward and anastomosing, the petiole 2 mm. long, pubescent. Flowers axillary, solitary; pedicel very short, 1–2 mm. long, densely sericeous; bracteoles 2, persistent, sepaloid, ovate, opposite, immediately below the calyx, about as long as the pedicel, densely sericeous; calyx-lobes 5, imbricate, unequal, thickened, deltoid-ovate, acute, sericeous on the exterior surface, glabrous within, the two outer lobes 3–5 mm. long, 2–3 mm. wide, 3 inner lobes larger, 4–7 mm. long, 3–3.5 mm. wide; corolla-lobes 5, white, broadly obovate, 8–9 mm. long, 7–8 mm. wide, rounded at the apex, sericeous along the median portion of the exterior surface, otherwise glabrous; stamens (fide Airy-Shaw) about 30, uni-seriate, 4–6 mm. long, joined at the base and adnate to the base of the corolla, the filaments hairy along the upper portion, the lower part glabrous, the anthers lanceolate, 2–3 mm. long, sericeous on lower portion of dorsal surface, otherwise glabrous; ovary depressed-globose, 2.5 cm. diam., densely sericeous, 2-celled, pauci-ovulate, the style 5–6 mm. long, glabrous or slightly pubescent at the base. Fruit (Airy-Shaw) subglobose, ca. 8 mm. diam., long-pilose, 2-celled, each cell one-seeded. Seeds discoid, 6–7 mm. diam., 1–2 mm. thick, shining.

According to Airy-Shaw's findings, the developed fruit of this species is two-celled with a single large seed in each cell. I have not had an opportunity to observe this unusual feature but have examined an ovary from a bud of an isotype. A dissection showed the two cells in the ovary with a small number (approximately four) of ovules in each cell. This was the first species described with a two-celled ovary and fruit. The seeds are 6–7 mm. long, adding another species to the small group in which the seeds are few in number and develop to a size at least twice that which is found in the majority of species in this genus. In this paper a second species with a two-celled ovary, *A. nunkokensis*, is presented. This latter species has been collected on Mt. Nunkok, Mt. Kinabalu, in British North Borneo. The only evidence of relationship between these two entities appears to be the two-celled ovary.

Besides the ovary, the features which are helpful in identification are: (1) nearly sessile leaves with the petiole not more than 2 mm. long, and the apex long-acuminate; (2) pedicels very brief (1–2 mm. long), or the flowers subsessile; and (3) ovary and fruit long-pilose, the style glabrous except at the base.

41. **Adinandra parvifolia** Ridley in Jour. As. Soc. Straits Settl. 54: 23. 1910; Fl. Malay Penin. 1: 195. 1922. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.
Adinandra montana Ridley in Jour. Fed. Malay States Mus. 6: 44. 1915. — Non Merrill.

DISTRIBUTION: Malay Peninsula (Pahang, Perak).

PAHANG: Gunong Tahan, alt. 1650–1800 m., *L. Wray & H. C. Robinson 5517* (K), July 12, 1905 (tree 10–15 m. high with white flowers). PERAK: Gunong Kerbau, alt. 2200 m., *H. C. Robinson s. n.* (TYPE of *A. montana,* K), March 14, 1913.

Tree 10–15 m. high; branches grayish brown, terete, glabrous, the branchlets brown, glabrous, the terminal buds sericeous. Leaves coriaceous, glabrous, elliptic, 6–8 cm. long, 3–4 cm. wide, obtuse at the apex, acute at the base, the margin somewhat recurved, lightly glandular-serrulate, the veins ca. 6–8 pairs, usually rather inconspicuous, occasionally conspicuous, dark glandular-dotted on the lower surface, the petiole 5–7 mm. long. Flowers axillary, solitary, large, ca. 2 cm. in diameter; pedicel ca. 1 cm. long, glabrous; bracteoles 2, persistent, opposite, immediately below the calyx, glabrous, broadly ovate, unequal, ca. 2 × 2 mm. and 3 × 3 mm.; calyx-lobes 5, imbricate, ca. 1 cm. long and wide, unequal, the outer lobes broadly ovate, finely pubescent over all the external surface, the inner lobes more nearly rounded, pubescent on the central portion of the external surface only, the margin scarious, glabrous; corolla-lobes 5, lightly connate at the very base, obovate, 15–16 mm. long, 9–12 mm. wide, pubescent on the upper half of the median portion of the external surface; stamens 40–45, ?-seriate, unequal 8–12 mm. long, the filaments variable in length 3–6.5 mm. long, pubescent on the upper third, joined at the base, adnate to the base of the corolla, the anthers oblong, ca. 5 mm. long, hirsute; ovary ca. 5 mm. across, densely pubescent, longitudinally furrowed, 5-celled, multi-ovulate, tapering at the apex into a style ca. 1 cm. long. Fruit not seen.

The outstanding characters of this species to be used in determination are: (1) small oblong-elliptic leaves up to 8 cm. long, lightly veined with 6–8 pairs of veins; (2) glabrous pedicels (ca. 1 cm. long) and bracteoles, the latter persistent, unequal, and broadly ovate; (3) broadly spreading flowers, up to 2 cm. in diameter with long (15–16 mm.) pubescent corolla-lobes; (4) stamens long (up to 12 mm.), the anthers hirsute, ca. 5 mm. long, the filaments up to 6.5 mm. long and pubescent along the upper third, otherwise glabrous; and (5) ovary pubescent, longitudinally furrowed, 5-celled.

Ridley himself listed *A. montana* Ridley as a synonym of this species. *Adinandra montana* Ridley (1915) should not be confused with the earlier *A. montana* Merrill (1910) from the Philippine Islands. The latter species has been transferred to *Cleyera japonica* Thunberg emend. Sieb. & Zucc. var. *montana* (Merrill) Kobuski.

42. **Adinandra Hullettii** King in Jour. As. Soc. Bengal 59 (2): 191 (Mater. Fl. Malay Penin. 1: 131). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Ridley, Fl. Malay Penin. 1: 196. 1922. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Malay Peninsula (Singapore).

SINGAPORE: Entrance to Botanic Garden, *R. W. Hullett 103* (TYPE, K), July 1885.

Tree; branches terete, pubescent, furrowed, light brown, the young branchlets densely and minutely rusty-tomentose, the terminal buds densely tawny-sericeous. Leaves coriaceous, oblong-elliptic, 9–14 cm. long, 4–5.5 cm. wide, shortly and bluntly acuminate at the apex, acute at the base, the

margin denticulate, slightly recurved when dry, the upper surface smooth, shining, glabrous, the lower surface opaque, densely and minutely tomentose, the midrib prominent, the nerves spreading, obscure, ca. 10 pairs, the petiole ca. 5 mm. long. Flowers axillary, solitary or in twos; pedicel tomentose, ca. 1 cm. long; bracteoles 2, opposite, persistent, close to the calyx, broadly ovate or deltoid, ca. 5 × 5 mm. and 3 × 3 mm., densely pubescent; calyx-lobes 5, imbricate, fleshy, spreading, broadly ovate, unequal, the two outer lobes joined at the base appearing as though coalesced, ca. 10 mm. long, 8–9 mm. wide, pubescent over the entire exterior surface, the three inner lobes broader than long, ca. 8 mm. long, 9 mm. wide, pubescent on the central portion of the exterior surface, the margin deeply scarious; corolla-lobes 5, ca. 12 mm. long, 5 mm. wide, connate for ca. 5 mm. from the base, rounded and recurved at the apex, glabrous; stamens ca. 45, seemingly 3-seriate, the outer stamens erect, the second and third rows somewhat geniculate with the third or innermost row more geniculate, quite equal in length, the filaments ca. 4 mm. long, geniculate near the anthers, the outer row glabrous, the inner rows occasionally pubescent at the point of geniculation, otherwise glabrous, the anthers oblong, ca. 5 mm. long, densely hirsute, tapering into long, quite blunt apicules, the apicules glabrous; ovary conical-hemispherical appressed-sericeous, ca. 4 mm. diameter, 5-celled, multi-ovulate, tapering into an entire style ca. 6 mm. long, glabrous except at the juncture with the ovary. Fruit not seen.

Some of the outstanding features of this species are: (1) 5-celled sericeous ovary; (2) crowded stamens (ca. 45), with filaments glabrous, the inner two rows geniculate towards the apex, the anthers oblong hirsute, and the apicule long, blunt, glabrous; (3) corolla-lobes glabrous, recurved, connate for nearly one-half their length; (4) style glabrous; (5) bracteoles persistent, opposite, unequal, densely pubescent; and (6) both branches and branchlets densely pubescent.

Melchior, in his key to the species, refers to the filaments as pubescent. My dissections show the filaments to be glabrous, and since King did not mention pubescence in describing the filaments one must assume that he also considered them glabrous. His description proved to be most detailed and accurate.

43. **Adinandra maculosa** T. Anderson ex Dyer in Hooker f., Fl. Brit. Ind. 1: 282. 1874. — King in Jour. As. Soc. Bengal 59 (2): 189 (Mater. Fl. Malay Penin. 1: 129). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Ridley, Fl. Malay Penin. 1: 195. 1922. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

Ternstroemia ? integerrima Wallich, Cat. no. 1452 (in Herb. Kew, not in Herb. Linn. Soc.). Non T. Anderson.

DISTRIBUTION: Malay Peninsula (Pahang, Penang, Perak).

PAHANG: Fraser's Hill, *E. J. H. Corner 33170* (A), Aug. 4, 1937. — Fraser's Hill, upon the Selangor border, alt. 1250 1350 m., *M. Nur 11320* (A), Sept. 1, 1923. PENANG: *N. Wallich 1452* (TYPE, K). PERAK: Larut, rocky locality, rich soil, alt. 800–1000 m., *Dr. King's Collector 6331* (A), July 1884 (tree 15–30 m. high; flowers white, dark blue within, with glossy, waxy stamens). Exact locality lacking: *A. C. Maingay 186* (G).

Tree up to 25 m. high; branches terete, brown, glabrous, the branchlets brown, glabrous, appressed-pubescent near the apex, the terminal buds

small, appressed-pubescent. Leaves heavily coriaceous, elliptic to subrotund, 10–15 cm. long, 4–5 cm. wide, shortly and abruptly acuminate at the apex, tapering at the base, glabrous, shining above, paler, dull, opaque, minutely roughened, generally glabrous beneath, occasionally lightly pubescent along the lower midrib, the margin entire, the veins very indistinct on both surfaces, the petiole ca. 5 mm. long. Flowers axillary, solitary; pedicels ca. 1 cm. long, generally appressed-pubescent; bracteoles 2, persistent, opposite or subopposite, immediately below the calyx-lobes, subrotund, unequal, 2–3 mm. long, appressed-pubescent; calyx-lobes 5, imbricate, appressed-pubescent, unequal, ca. 7 mm. long, the inner lobes pubescent on the central portion of the external surface, thinner and glabrous at the margin; corolla-lobes (fide King) "membranous, ovate, acute, glabrous, connivent"; stamens (fide King) "about 30; filaments attached to the petals, short, glabrous; anthers narrow, the cells elongate, lateral; the connective sericeous with short glabrous apiculus"; ovary depressed-hemispheric, pubescent, 5-celled, multi-ovulate, the style glabrous. Fruit ca. 1 cm. in diameter, globular, at first pubescent, later glabrescent, the seeds numerous, small, shining, dark.

Anderson describes the leaves of this species as "finely mottled beneath with reddish-brown remotely denticulate glabrous." The leaves of the type are finely but obscurely mottled beneath with reddish brown patches. However, on no other specimen examined did I find the coloration. King (and I depended much on his excellent description) refers to the under surface of the leaf as "pale brown, dull, opaque, minutely rugulose when dry." This species seems most closely related to *A. integerrima* T. Anders. which has silky pubescent terminal buds and thinner leaves. In *A. maculosa*, the leaves are unusually thick, with the veins obscure, if at all obvious, on both surfaces.

Characters which are helpful in determination are: (1) thick glabrous leaves, opaque beneath and very abruptly acuminate; (2) corolla-lobes glabrous; (3) bracteoles persistent, subrotund and pubescent; (4) ovary densely pubescent, 5-celled with the style glabrous; and (5) filaments glabrous.

44. **Adinandra nunkokensis**, sp. nov.

Ramuli tereti, brunnei, pubescentes, gemmis terminalibus, conicis, dense sericeis. Folia coriacea, elliptico-obovata, 8–14 cm. longa, 2.5–4.5 cm. lata, apice acuminata, basi acuta, supra glabra nitida, subtus leviter adpresso-pubescentia, margine leviter denticulata, nervis lateralibus primariis 6–8 paribus, gracilibus intra marginem anastomosantibus, venis secundariis inter primarias frequentibus, petiolis 4–7 mm. longis, supra planis glabris, subtus semi-teretibus, dense pubescentibus. Flores axillares, solitarii vel bini; pedicellis rugulosis, brevioribus crassioribusque, ca. 5 mm. longis, 4 mm. crassis, recurvatis, leviter adpresso-pubescentibus; bracteolis 2, alternatis, persistentibus, late ovatis, subaequalibus, ca. 2.5–3 mm. longis et 3 mm. latis, leviter adpresso-pubescentibus; sepalis 5, imbricatis, rugulosis, subrotundatis, ca. 7 mm. longis, 5–6 mm. latis, pubescentibus, margine subscariosis glandulosis; petalis 5, basi connatis, cremeis, oblongis, 12–14 mm. longis, 5–7 mm. latis, medio dorso sericeis; staminibus 30–35, 4-seriatis, inaequalibus, 8–11 mm. longis; filamentis

4–7 mm. longis, in toto connatis, basi ad corollam adnatis, inferne nudis, superne hirsutis, antheris ca. 4 mm. longis, dense hirsutis, vix apiculatis, ovario subgloboso dense sericeo, ca. 4–5 mm. diametro, 2-loculari, pauci-ovulato, ovulis magnis, stylo gracile, ca. 11 mm. longo, basi hirsuto, superne glabro. Fructus non visus.

DISTRIBUTION: British North Borneo.

BRITISH NORTH BORNEO: Mt. Kinabalu, Mt. Nunkok, alt. 800 m., *J. & M. S. Clemens 32900* (TYPE, A), April 22, 1933.

This species is related to Airy-Shaw's *A. subsessilis* of Sarawak. Both have two-celled ovaries. Although no fruiting specimen was available for this study, I feel, from the small number and the large size of the ovules, that *A. nunkokensis* will probably have very few seeds. *Adinandra subsessilis* produces two seeds in fruit, one in each cell. The flowers in *A. subsessilis* are nearly sessile, with pedicels only 1–2 mm. long, the bracteoles sepaloid, the calyx-lobes distinctly acute, the stamens uni-seriate and only 4–6 mm. long, and the style 5–6 mm. long. The leaves are more finely acuminate at the apex, the petiole but 2 mm. long, and there are 12–14 pairs of veins, prominent on both surfaces.

In *A. nunkokensis* the flowers are briefly pedicellate, but the pedicels are longer (ca. 5 mm.) than those in *A. subsessilis* and much thicker, the bracteoles are more rounded, the calyx-lobes subrotund, the stamens 4-seriate and 7–11 mm. long, the style 11 mm. long. The leaves are acuminate but not as finely attenuate as in *A. subsessilis*, the petiole 6–8 mm. long and there are only 6–8 pairs of veins.

45. **Adinandra Corneriana**, sp. nov.

Arbor?; ramis teretibus, brunneis, pubescentibus, ramulis crassis, teretibus, brunneis, dense luteo-ferrugineo-pubescentibus, gemmis terminalibus crasso-conicis dense ferrugineo-sericeis. Folia chartacea vel subcoriacea, oblongo-elliptica vel obovata, 14–20 cm. longa, 6–9 cm. lata, apice acuta vel obtusa, leviter acuminata, basi cuneata vel obovata, supra glabra, subtus dense pubescentia, praecipue secundum costam, margine glanduloso-serrata, venis lateralibus 10–12 primariis paribus, leviter conspicuis, gracilibus ad marginem anastomosantibus arcuantibusque, venis secundariis inter primarias frequentibus, petiolis pubescentibus, 4–7 mm. longis. Flores axillares, ut videtur solitarii, pedicellis teretibus, recurvatis, 8–10 mm. longis, dense ferrugineo-sericeis; bracteolis oppositis, persistentibus, late ovatis vel subtriangularibus, inaequalibus, dense ferrugineo-sericeis; sepalis 5, imbricatis, exteriore omnino dense adpresso-pubescentibus, interiore glabris, binis exterioribus subdeltoideis, 6–8 mm. longis et latis, tribus interioribus maioribus, 8–10 cm. longis, 10–11 mm. latis; petalis basi connatis, apice acutis, exteriore luteo-pubescentibus; stamina 30–35, 3- vel 4-seriatis, filamentis connatis, basi corollam adnatis, exteriore dense hirsutis, antheris oblongis, dense hirsutis, ovario semigloboso, hirsuto, 3-loculari, pauci-ovulato, stylo glabro, circiter 5 mm. longo. Fructus globosi, hirsuti, circiter 8 mm. diametro, 3-loculares, uno semine in quoque loculo, seminibus subplanis, hippocrepiformibus, magnis, nitidis, circiter 5 mm. longis et 3 mm. latis.

DISTRIBUTION: Malay Peninsula (Johore).

JOHORE: Mawai-Jemaluang road (13.5 miles), by stream on hillock, at low alti-

tude, *E. J. H. Corner 29010* (TYPE K, fragment A), Feb. 8, 1935. Mawai-Jemaluang road (13.5 miles), at low altitude, *E. J. H. Corner 29426* (K), May 13, 1935.—S. Kayu Ara, Mawai Jemaluang road, in dry Dryobalanops forest, at low altitude, *E. J. H. Corner 29376* (K), May 5, 1935.

Although three excellent specimens have been collected of this species, the material appears rather sparse. As a result few dissections were made. Since no open flowers were available, the buds were used. Hence I have refrained from recording measurements of such parts as corolla-lobes and stamens which were obviously not fully developed. However, the characters which might be used in a key, other than size, have been recorded above.

The three-celled ovary and fruit, with few ovules and seeds are important characters. The ovary of the bud (*Corner 29010* type) exhibited few large ovules, hence one might anticipate fewer and larger seeds in the fruit. For the study of the fruit *Corner 29376* was used. Here, in both fruits examined, it was found that a single large seed developed in each of the three cells of the fruit. Size is the distinctive element. Otherwise, the seeds were typical of the genus.

All three specimens were collected by E. J. H. Corner in Johore at varying dates during the year 1935. It is a pleasure to name this species *A. Corneriana* in his honor.

46. **Adinandra caudatifolia**, sp. nov.

Arbor ad 35 m. alta; ramis teretibus glabris, griseo-brunneis, ramulis teretibus, glabris, brunneis, ramulis juventutissimis adpresso-pubescentibus, gemmis terminalibus gracilibus, adpresso-sericeis. Folia chartacea, elliptica, 5–8 cm. longa, 2.5–3.5 cm. lata, apice abrupte caudata, basi acuta, obtusa vel subrotundata, supra nitida, glabra, subtus pallidiora glabra, rariter leviter pubescentibus, margine integra vel leviter crenulata, venis primariis ca. 8 paribus, intra marginem anastomosantibus arcuantibusque, petiolis minutis circiter 4 mm. longis, glabris. Flores non visi. Fructus axillares, ut videtur solitarii; pedicellis teretibus, glabris, ca. 2 cm. longis, verruculosis subferrugineis; bracteolis 2, oppositis, persistentibus, minutis circiter 1 mm. longis; sepalis 5, imbricatis, subrotundatis, recurvatis, glabrescentibus, circiter 5–6 mm. longis, 4–5 mm. latis. Fructus globosus, glabrescens, circiter 1.5 cm. longus, 1 cm. latus, 3-locularis, seminibus circiter 9, magnis, subplanis, nitidis, circiter 7 × 5 mm.

DISTRIBUTION: British North Borneo.

BRITISH NORTH BORNEO. Upper Mt. Kinabalu, Penibukan, west ridge, jungle, alt. 1700 m., *J. & M. S. Clemens 50377* (TYPE, A), Nov. 4, 1933 (tree 20 m.; fruit green).—Upper Mt. Kinabalu, Penibukan, east ridge, jungle, alt. 1850 m., *J. & M. S. Clemens 50387* (A), Nov. 13, 1933 (tree 30 m.; fruit brown-purple).

The species, *A. caudatifolia*, as the name signifies, is characterized by the tail-like apex of the leaf. Furthermore, the leaf is chartaceous, rather than coriaceous, as is the case in most species.

The material lacks flowers. The fruit, with its evidence of pubescence both at the apex and base, shows that the ovary had been quite densely pubescent. This pubescence extends up the style. To what extent is not known, since all styles were broken near the base. The fruit is distinctly three-celled and the seeds large (ca. 7 × 5 mm.) and few in number (ca.

3 to each cell). The pedicels are verruculose with subferrugineous swellings.

47. **Adinandra acuminata** Korthals, Verh. Nat. Gesch. Bot. ed. Temminck 109. 1840. — Miquel, Fl. Ned. Ind. 1 (2): 478. 1859; Ann. Mus. Bot. Lugd.-Bat. 4: 103. 1868. — Dyer in Jour. Linn. Soc. Bot. 13: 330. 1873; in Hooker f., Fl. Brit. Ind. 1: 282. 1874. — King in Jour. As. Soc. Bengal 59 (2): 190 (Mater. Fl. Malay Penin. 1: 128). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Ridley, Fl. Malay Penin. 1: 194. 1922. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

Gordonia acuminata Wallich, Cat. no. 3664 in Herb. Linn. Soc.

Ternstroemia ? coriacea Wallich, Cat. no. 1453.

Camellia axillaris Wallich, Cat., p. 158 (not of Roxb. ex Bot. Reg. 349, see Jour. Linn. Soc. Bot. 13: 330. 1873).

Polyspora axillaris Choisy in Mém. Soc. Phys. Hist. Nat. Genève 1: 179 (Mém. Ternstr. 91) 1855. Non Don.

DISTRIBUTION: Malay Peninsula, Sumatra.

MALAY PENINSULA: Johore: Gunong Pulai, alt. 300 m., *M. R. Henderson 28514* (K), April 29, 1934 (small slender tree 7–8 m. high; flowers white). — Kluang, *Forest Ranger (Abdul Rahim) 5918* (K), May 3, 1925. — Sedanah, *H. N. Ridley 13504* (K), Nov. 24, 1908. Perak: Larut, open top of mountain, alt. 1000 1300 m., *Dr. King's Collector 6289* (K), July 1884 (tree 12–15 m. high; leaves dark glossy green). — *B. Scortechini 345* (K). — Gunong Butu, Puteh, Lower Camp, alt. 1130 m., *L. Wray 1158* (K). — Exact locality lacking, *L. Wray 2804* (US). — Larut, high mountains, alt. 1200–1300 m., *Dr. King's Collector 6352* (US), July 1884 (tree 20 30 m. high; leaves rich glossy green; fruit grayish brown). Penang: Western Hill, along path, alt. 800 900 m., *M. R. Henderson 21358* (K), Sept. 21, 1934 (small slender tree). — Government Hill, *A. C. Maingay 2267 (185)* (G, US), Feb. 1867. — Open jungle, hilly locale, alt. 300–600 m., *Dr. King's Collector 4842* (US), Aug. 1883 (tree 20–30 m. high; leaves dark glossy green; flowers white). Malacca: Garden jungle, *H. N. Ridley 1952* (A), *11334* (K), 1892 and 1893. Singapore: Bukit Timah, *E. J. H. Corner 34932* (A, K), April 12, 1938. — Common, *H. J. Murton 111* (G, K), Dec. 1878. Pahang: Enden, *F. G. Mohamud 15518* (K), Aug. 31, 1929.

SUMATRA: Exact locality lacking, *P. W. Korthals s. n.* (probable ISOTYPES, G, US), 1864.

Small tree up to 25 m. high; branches brown-gray, terete, glabrous, the branchlets glabrous except for the appressed pubescence on the current year's growth, the terminal buds elongated, densely sericeous. Leaves coriaceous, oblong-elliptic to broadly ovate, 8–15 cm. long, 4–5 (–6) cm. wide, generally sharply and finely acuminate (up to 3 cm. long) at the apex, occasionally less prominent, acute at the base, glossy, dark green, glabrous above, somewhat paler, glabrous or scattered-pubescent beneath, the margin entire or obsoletely denticulate, the veins ca. 12 pairs, usually with double arching, not always, the petiole ca. 5 mm. long. Flowers axillary, solitary or in twos; pedicels terete, ca. 1 cm. long, finely appressed-pubescent at first, later glabrescent, smooth at anthesis, later developing wart-like protuberances becoming very rough and pronounced at the fruiting stage; bracteoles 2, persistent, alternate along the pedicel, the upper one not close to the calyx, small triangular, ca. 1 mm. long, usually appressed-pubescent; calyx-lobes 5, imbricate, finely appressed-pubescent, unequal, ca. 6–7 mm. long, the outer two lobes narrower, ca. 3 mm. wide, the inner three lobes more rounded ca. 5.5 mm. wide; corolla-lobes 5, connate at the base, rounded at the apex, ca. 10 mm. long, 7 mm. wide,

lightly appressed-sericeous on the median portion of the external surface; stamens seemingly 4-seriate, unequal in length, up to 10 mm. long, the filaments adnate to the base of the corolla, connate the length of the shortest stamen, free from that point, lightly pubescent on the inner surface, the anthers elongate, short-hirsute; ovary conical, densely pubescent, ca. 3 mm. across, 3-celled, pauci-ovulate, tapering at the apex into an entire style 7–8 mm. long, pubescent nearly to the apex. Fruit quite globose, up to 2 cm. diameter, glabrescent with evidence of pubescence near the apex, few-seeded, the pedicel at this stage rugged and warty, the seeds light in color, ca. 6 mm. long.

Until borrowed material from Kew was obtained this species presented considerable difficulty. In the original description, Korthals stated that the sepals were glabrous and the fruit 4- or 2-celled. My study revealed the sepals to be distinctly appressed-pubescent and the ovary definitely 3-celled. However, these conclusions were drawn from Malayan material rather than Sumatran. Dyer, in Hooker f., Fl. Brit. India, 1: 282. 1874, stated also that the sepals and the leaves were glabrous. Later King (Jour. As. Soc. Bengal 59 (2): 190 [Mater. Fl. Malay Penin. 1: 128]. 1890) remarked that the species was glabrous in all parts except the stamens, and Ridley (Fl. Malay Penin. 1: 194. 1922) gave the same impression.

From all the material examined I find the species to be quite pubescent. Korthals gave this impression in his description, and authentic Korthals specimens from Sumatra, although lacking both flowers and fruit, show the young branchlets, buds and leaves to be pubescent.

At first I felt that the British botanists were misinterpreting Korthals' species and perhaps were working with an entirely different species. However, the material from the Kew herbarium agreed with our own specimens in all instances, some actually being duplicates. The young branchlets, buds, under surface of leaves, pedicels, bracteoles, calyx-lobes, corolla-lobes, stamens, ovary and style are all pubescent in varying degrees. The leaves, calyx-lobes, pedicels, bracteoles and fruit tend to become glabrescent.

The apex of the leaves of the Sumatran material is much more fine- and long-acuminate than the apex of those of the Malayan material. In some of the Korthals specimens the acumen is drawn out to as much as 3 cm. and appears somewhat caudate. In the Malayan material, although definitely acuminate, the leaves are seldom as distinctive. Some workers have placed stress on the double arching of the veins of the leaves. This character varies considerably and is hardly stable. Also the wart-like condition of the fruiting pedicel has been stressed. As striking as this character happens to be, it is not found in the flowering material, for some reason not appearing until the developing fruit stage.

Other characters which may be used in determination are (1) the alternate, small, persistent, triangular bracteoles; (2) the pubescent calyx-lobes and corolla-lobes; (3) the pubescent filaments joined the length of the shortest filament in series; (4) the pubescent, 3-celled ovary, pauci-ovulate, and the 3-celled fruit, few and large seeded; and (5) the entire style pubescent almost to the apex.

The synonymy cited above is merely quoted from Dyer in Hooker f. Fl. Brit. India, 1: 282. 1874. It has not been possible for me to verify these names. However, I wish to have them quoted here as a record.

VERNACULAR NAMES: *Kelat, Membasah.*

48. **Adinandra integerrima** T. Anderson ex Dyer in Hooker f., Fl. Brit. Ind. 1: 282. 1874. — King in Jour. As. Soc. Bengal 59 (2): 190 (Mater. Fl. Malay Penin. 1: 130). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Ridley, Fl. Malay Penin. 1: 196. 1922. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925. — Craib, Fl. Siam. Enum. 1: 125. 1925.

Adinandra dasyantha Choisy in Mém. Soc. Phys. Nat. Genève, 1: 112 (Mém. Ternstr. 24). 1855. — Non Korthals.

Ternstroemia integerrima Wallich, Cat. no. 1452, in Herb. Linn. Soc.

Ternstroemia reticulata Wallich, Cat. no. 2246.

Gordonia reticulata Wallich, Cat. no. 3663.

Camellia japonica Wallich, Cat. no. 3667, in herb. Kew, not in Herb. Linn. Soc.

Adinandra integerrima Pierre var. *a nigro-punctata* Pierre, Fl. For. Cochinchine 2: t. 125. 1887.

DISTRIBUTION: Malay Peninsula.

PENANG: *N. Wallich 3663* (TYPE, K). JOHORE: *H. N. Ridley 6336* (K). PAHANG: Sungei Yet., Bukit Fraser, alt. 1250 m., *Native Collector 11149* (A), Sept. 29, 1923. Exact locality lacking, *N. Wallich 3667* (K).

Small tree; branches terete, brown-gray, the branchlets appressed-fulvous-pubescent, the very young branchlets of current year's growth densely so, the terminal bud densely fulvous-pubescent. Leaves subcoriaceous or coriaceous, ovate to oblong-ovate to oblong-elliptic, 8–13 cm. long, 4–5 cm. wide, acuminate at the apex, usually acute at the base, occasionally somewhat rounded, the upper surface shining, glabrous, lower surface paler in color, sparsely pubescent (especially on the midrib) and covered with minute dark dots, the margin glandular-denticulate, the veins 10–12 pairs, slightly conspicuous on both surfaces, the petiole 5–7 mm. long, flat above, rounded beneath, pubescent. Flowers axillary, solitary; pedicel up to 1 cm. long, appressed-pilose; bracteoles 2, persistent, opposite, immediately below the calyx, pubescent, unequal, the smaller ca. 2 mm. long, acute, the larger more rounded; calyx-lobes 5, imbricate, densely sericeous, unequal, the two outer lobes larger ca. 7–8 mm. long at anthesis, broadly ovate, thick, the margin thin, denticulate, accrescent, up to 1 cm. long in fruit; corolla-lobes 5, connate at the base, ca. 1 cm. long, lightly sericeous on the upper median portion of the external surface, otherwise glabrous; stamens seriate, ca. 40, adnate to the base of the corolla, the filaments united for the most part, ca. 2 mm. long, glabrous, the anthers ca. 3 mm. long, hirsute, the apicule 1+ mm. long; ovary depressed-hemispheric, appressed-sericeous, 5-celled, multi-ovulate, the style sericeous. Fruit appressed-pubescent, 1.75 cm. diam. (fide Dyer), the seeds small, many.

Authentic material, *Wallich 3663, 3667*, original collections of the species loaned from Kew, were used in drawing up the above description. The synonymy cited above is borrowed from Anderson in Hooker f., Fl. British India. No opportunity has been afforded me to actually study the specimens cited as synonyms. They are listed here in compilation.

Characters helpful in determination are: (1) fulvous-pubescent branchlets; (2) short, recurved pedicels, seldom over 1 cm. long; (3)

persistent bracteoles, unequal and opposite; (4) calyx-lobes densely sericeous, the two outer lobes often appearing as a single huge bract; (5) short corolla-lobes, sericeous near the apex of the median portion of the external surface; (6) glabrous filaments and oblong short-hirsute anthers, the apicule over 1 cm. long; and (7) ovary and fruit 5-celled, densely sericeous.

49. **Adinandra collina**, sp. nov.

Arbor parva; ramulis teretibus, glabris, griseo-brunneis, gemmis terminalibus elongatis, glabris (costis marginibusque exceptis). Folia coriacea, elliptico-oblonga, 8–10 cm. longa, 3–4.5 cm. lata, apice subrotundata abrupte acuminata, basi cuneata, supra glabra, subtus glabra costa excepta, costa supra plana, subtus elevata, glabra vel leviter pubescente, ut videtur bisulcata, margine subintegra, minutissime serrulato-crenulata, nervis undique obscurissimis, petiolis glabris, 6–8 mm. longis. Flores axillares, solitarii vel bini; pedicellis glabris, circa 1 cm. longis, apice recurvatis; bracteolis 2, persistentibus, glabris rare leviter pubescentibus ciliolatisque, inaequalibus, alternatis, inferiore minoreque late ovata, circa 2 mm. longa et 2.5 mm. lata, superiore maioreque subrotundata, circa 3 mm. longa et 2.5 mm. lata; sepalis 5, imbricatis, glabris, ciliolatis, inaequalibus, exterioribus 2 late ovatis, circa 4 mm. longis et 5 mm. latis, interioribus 3 subrotundatis, 5–6 mm. longis et 5 7 mm. latis; petalis 5, basi connatis, oblongo-obovatis, glabris, inaequalibus, 16–18 mm. longis, 5 7 mm. latis, apice rotundatis, abrupte apiculatis, apiculis circa 2 mm. longis; staminibus circa 30, ?-seriatis, inaequalibus, 12–15 mm. longis, filamentis 7–9 mm. longis, basi breviter connatis et petalis brevissime vel vix adnatis, ad apicem accrescentibus, inferne nudis, superne pubescentibus, antheris oblongis, albido-hirsutis, 4–5 mm. longis, apiculis glabris, circa 0.5–1 mm. longis; ovario subgloboso, glabro, circa 4 mm. diametro, apice abrupte attenuato, 5-loculari, multi-ovulato, stylo glabro, elongato, circa 1 mm. longo, stigmate minuto. Capsula subglobosa, glabra, circa 1 cm. diametro, 5-locularis, multi-seminata; semina discoidea, castanea, nitidula, circa 2 mm. diametro.

DISTRIBUTION: Sarawak, British North Borneo, Borneo.

SARAWAK: Kuching, *G. D. & C. Haviland 852* (TYPE, G), Dec. 1892. — Mount Matang, near bungalow, *J. & M. S. Clemens 20980 (7447)* (A), Oct. 24, 1929 (tree 12 m. high; flower-buds cream-colored). — *Sarawak Museum (Native Collector) 136* (A, G, US), *1708* (A, US), *1957* (A, G), *5135* (A, NY, US). BRITISH NORTH BORNEO: Mt. Bungal, *M. S. Clemens 11209* (A), Dec. 9 10, 1915. — Kibayo to Keung, Keung trail, *M. S. Clemens 9882* (A, PBS), Oct. 29, 1915. — Sunsuron, Tamboenan, hilltop, alt. 450 m., *Puasa-Angian* (*British N. Borneo For. Dept.* no. *3938*) (A, K), Feb. 10, 1934 (tree 10 m. high, fruit green). — *H. Lowe s. n.* (G). — Mt. Kinabalu, Dallas, alt. 1000 m., *J. & M. S. Clemens 26853* (A), Oct. 23, 1931 (flowers cream-colored; fruit green). BORNEO: Sanggouw, *H. Hallier 950* (NY), 1893–94. — Beorbeo (southeast Borneo), West Koetai, alt. 30 m., *Neth. Ind. For. Serv. b.b. 16153* (A), Nov.-Dec. 1931.

In many characteristics, *A. collina* resembles *A. verrucosa* Stapf, to which it is closely related. Both have bisulcate midribs on the under surface of the leaf, the more noticeable in *A. verrucosa*. Both species are quite glabrous and resemble *A. dumosa* Jack in this respect. However, the two Bornean species have pubescence on the young terminal buds whereas in *A. dumosa* the terminal bud is always strictly glabrous.

In *A. verrucosa* the leaves are larger, coarser, obtuse and bluntly emarginate at the apex, the midrib beneath is always glabrous. In *A. collina* the leaves are acuminate at the apex and a fine pubescence is found along the midrib on the under surface. The branchlets in the former species are very thick, measuring up to 4 and 5 mm. in diameter near the apex. In *A. collina* the branchlets are smooth, terete and measure only 1–2 mm. in diameter. The petiole in *A. verrucosa* is short and sturdy and when breaking off from the branchlets leaves a large scar. The pedicels are very short and thick, seldom measuring over 5 mm. long, and often measuring the same in thickness. In *A. collina* the pedicels measure up to 2 cm. or more (1 cm. in type), and are comparatively slender. The corolla-lobes of *A. verrucosa* measure 10–12 mm. in width while in those of *A. collina* the measurement is 6–8 mm. in width. *Adinandra verrucosa,* to date, has been found only in the "upper-mountain" zone (6000–10500 ft.), of Mt. Kinabalu, as defined by Stapf, whereas *A. collina* is found at low altitudes of less than 1000 ft. in the "hill-zone." In the latter species, the majority of specimens cited were collected in Sarawak.

In *A. dumosa,* as far as I have seen, there is no tendency toward pubescence. The terminal bud is strictly glabrous. The terminal bud seems to be a criterion of this variable tendency toward pubescence. In species where the terminal bud is pubescent, especially when the pubescence is of the appressed nature, there is a distinct tendency toward glabrescence. As a result, one may find varying degrees of pubescence on the leaves and floral parts, making it quite difficult to use the character of pubescence in a key or as a delimiting factor.

This same situation occurs in *A. collina.* The terminal leaf-bud is quite glabrous, yet one can find pubescence along the bisulcate midrib (which character is very obvious in the unfolding leaves) and along the margin. In the type cited above the specimen is quite glabrous and one must look most carefully to see evidences of pubescence. In other collections of the species, one may find distinct pubescence on the lower surface of the leaves and on the pedicels, bracteoles and calyx-lobes.

VERNACULAR NAME: *Bangkao* (Dusun).

50. **Adinandra Clemensiae,** sp. nov.

Arbor magna; ramis ramulisque teretibus, glabris brunneis vel griseo-brunneis, gemmis terminalibus minutis, conicis, sericeis. Folia chartacea vel subcoriacea, subrotundata, obovata vel elliptico-oblonga, 3.5–5 × 2–2.5 cm. (6–7 × 3–4.5 cm.), apice subrotundata, obtusata vel late obovata, basi late cuneata vel acuta, glabra, subtus fusco-punctata, margine subintegra, subrevoluta, venis supra obscuris, subtus 6–8 lateralibus primariis paribus intra marginem anastomosantibus, petiolis glabris, 6–9 mm. longis. Flores axillares, solitarii; pedicellis glabris, ca. 1 cm. longis, recurvatis; bracteolis 2, oppositis, persistentibus, glabris, juventute dense pubescentibus, inaequalibus, minore ca. 2 × 2.5 mm., apice rotundato, majore ca. 2 × 5 mm., apice rotundato; sepalis 5, imbricatis, pubescentibus, inaequalibus, tribus exterioribus crassioribus, pubescentioribus, 7–9 mm. longis, 6–8 mm. latis, subrotundatis, margine non scariosis, duobus interioribus, subellipticis, ca. 7 mm. longis, 5–6 mm. latis, margine

scariosis, ciliolatis; petalis 5, albis, basi ad 5 mm. connatis, glabris, obovato-oblongis, 15–16 mm. longis, ca. 5 mm. latis, apice obovatis vel subrotundatis; staminibus ca. 25, 3-seriatis, 9–11 mm. longis, filamentis 5–7 mm. longis, basi ad corollam adnatis, integre connatis, hirsutis, interioribus geniculatis, antheris oblongis, ca. 4 mm. longis, hirsutis, non apiculatis; ovario subgloboso, dense sericeo, circiter 3 mm. diametro, 5- (vel 4-) loculari, loculis multi-ovulatis, stylo circiter 14 mm. longo, glabro, basi sericeo. Fructus (*J. & M. S. Clemens 31385*) subglobosus, sericeus, ca. 10 mm. longus et 8 mm. diametro, 5-locularis, multi-seminatus; semina typica, nitida, ca. 2.5 mm. diametro.

DISTRIBUTION: British North Borneo (Mt. Kinabalu).

BRITISH NORTH BORNEO: Mt. Kinabalu: Tenompak, alt. 1650 m., *J. & M. S. Clemens 28453* (A), Feb. 7, 1932 (flowers cream tinged with purple).—Tenompak, alt. 1650 m., *J. & M. S. Clemens 28618* (A), March 2, 1932 (buds green; flowers cream tinged with pink, anthers brown).—Dallas, alt. 1000 m., *J. & M. S. Clemens 29355* (A), April 28, 1932 (flower-buds green tinged with purple).—Tenompak, alt. 1650 m., *J. & M. S. Clemens 30193* (A), Feb. 17, 1932 (flowers cream tinged with purple).

Dallas, alt. 1000 m., *J. & M. S. Clemens 30194* (A), April 28, 1932.—Tenompak, alt. 1650 m., *J. & M. S. Clemens 30201* (A), May 3, 1932 (flowers green with cream-colored pistils).—Penibukan, alt. 1350–1650 m., *J. & M. S. Clemens 31385* (A), Feb. 7, 1933 (tree 7 m. high).—Colombon River, alt. 1850 m., *J. & M. S. Clemens 32603* (A), June 10, 1933 (flower-bud pinkish).—Marai Parai, alt. 1650 m., *J. & M. S. Clemens 33074* (A), May 3, 1933.—Colombon River, alt. 2350 m., *J. & M. S. Clemens 33758* (A), June 28, 1933 (flower-buds dull pink; fruit green).—Colombon River, alt. 2000–2350 m., *J. & M. S. Clemens 33906* (A), July 12, 1933.—Colombon River, alt. 1850 m., *J. & M. S. Clemens 34090* (A), July 19, 1933 (flowers with pink tinge, the anthers brown, the pistil white).—Colombon River, alt. 1850 m., *J. & M. S. Clemens 34480* (TYPE, A), Aug. 10, 1933 (flowers white becoming dull salmon).—Colombon River basin, alt. 1500 m., *J. & M. S. Clemens 40122* (A), Aug. 24, 1933 (flowers white, the sepals and anthers purple-tinged).—Penibukan, jungle, alt. 1350 m., *J. & M. S. Clemens 50516* (A), Nov. 3, 1933 ("big tree"; style long; fruit gray).

Gurulau, crest of spur, alt. 1650 m., *J. & M. S. Clemens 50692* (A), Dec. 4, 1933 (tree 25 m. high; style elongated; fruit green).—Gurulau spur, mossy forest, alt. 2650 m., *J. & M. S. Clemens 50979* (A), Dec. 12, 1933 (small tree with gray fruit).

From the collections made on Mt. Kinabalu in British North Borneo by J. & M. S. Clemens, this species seems to be the most widespread in that area. Collections were obtained from Dallas, at 3000 ft. altitude, Tenompak, Penibukan, Marai Parai and Colombon River at 5000 ft. altitude and Gurulau spur at 5000 and 8000 ft. altitude. All specimens were collected at approximately 5000 ft. altitude with the exception of two from Dallas at 3000 ft. and one from Gurulau spur at 8000 ft. In most species of the genus the flower is white. In this species is found considerable variation in color ranging from a purple-tinge through salmon and pink to pure white. Color in the stamens is also mentioned.

The name *A. Clemensiae* is selected in honor of *Mrs. M. S. Clemens* who not only collected all the specimens cited for this species but many more specimens representative of various other species in this genus.

The ovary in the type-specimen, *J. & M. S. Clemens 34480* is more often four-celled than five-celled. At least, this was the case in the several dissections made for this study. However, a single dissection from *Clemens 40122*, collected in the same general locality, showed a five-celled

ovary. These two specimens, of all those cited above, are the only two in the flowering stage. The majority of specimens, obviously the same species, are in the bud stage. These buds, although sufficient for specific determination, are very unsatisfactory for ovary-dissections. Two specimens *J. & M. S. Clemens 50156* and *50979* are in the fruiting stage. From no. *50156*, three fruits have been laboriously sectioned from apex to base. Although to all appearances these fruits are normal, they proved to be solid and woody throughout with only occasional slits where cells might have been expected. In *J. & M. S. Clemens 50979* the fruit is found to be distinctly three-celled with few developed seeds. In this specimen the walls between the cells are very thick. Considering the fact that in most fruits the cell-walls are so fragile that it is often difficult to observe them with certainty, this thick-walled condition is most unusual. One may assume from these observations that *A. Clemensiae* may have an ovary with the number of cells varying from three to five.

The third fruiting specimen (*J. & M. S. Clemens 31385*) shows clearly a five-celled fruit with many seeds developed typical of the genus. In this specimen the cell-walls are thinner than those found in *J. & M. S. Clemens 50979*.

The small, thin, somewhat rounded leaves with long petioles present a character which makes this species easily recognizable.

51. **Adinandra magniflora**, sp. nov.

Arbor parva; ramis et ramulis teretibus, glabris, brunneis, innovationibus glabrescentibus vel leviter pubescentibus, gemmis terminalibus conicis, adpresso-pubescentibus. Folia coriacea, elliptica, 6–13 cm. longa, 4–7 cm. lata, apice abrupte lateque acuminata, basi late cuneata vel subrotundata, supra glabra, subtus fusco-punctata, glabra vel leviter pubescentia, margine integra, venis supra obscuris, subtus lateralibus primariis 8–10 paribus prominentibus, margine anastomosantibus arcuantibusque, venis secundariis inter primarias frequentibus, petiolis crassis, 2–4 mm. longis, glabris. Flores axillares, solitarii; pedicellis teretibus, crassis, 1–1.5 cm. longis, adpresso-pubescentibus; bracteolis 2, oppositis, subrotundatis, adpresso-pubescentibus, inaequalibus, circiter 5 × 6 mm. et 6 × 8 mm.; sepalis 5, imbricatis, subrotundatis, inaequalibus, 10 mm. longis, 9–11 mm. latis, interioribus margine scariosis; petalis 6, albidis, imbricatis, basi connatis, glabris, circiter 20 mm. longis, 8–10 mm. latis, apice obtusis vel subrotundatis; staminibus circiter 45, ut videtur 4-seriatis, 10–17 mm. longis, filamentis ad basim liberis, basi ad corollam adnatis, pubescentibus, 6–10 mm. longis, interioribus ad apicem accrescentibus, exterioribus gracilibus non accrescentibus, antheris linearibus, 4–5 mm. longis, hirsutis; ovario subgloboso, sericeo, 5-sulcato, 5-loculari, multi-ovulato, stylo gracile, glabro, circiter 15 mm. longo. Fructus elongato-globosus, sericeus, circiter 12 mm. longus, 8 mm. diametro, 5-locularis, multi-seminatus; semina rubra, minuta, 1.5 mm. vel minus longa et 1 mm. diametro.

DISTRIBUTION: British North Borneo.

BRITISH NORTH BORNEO: Mt. Kinabalu: Tenompak, alt. 1650 m., *J. & M. S. Clemens 29596* (A), May 7, 1932 (flowers cream-colored, the buds green). — Penibukan, canyon west of jungle, alt. 1350 m., *J. & M. S. Clemens 32040* (A), March 10, 1933. — Head of Dahobang, alt. 2000–2300 m., *J. & M. S. Clemens 32931* (TYPE, A), April 23, 1933 (flowers white). — Colombon River, alt. 1850 m., *J. & M. S. Clemens 33482* (A), Aug. 10, 1933 (flowers white with bright pink stamens).

When present, the open flowers of this species furnish the most outstanding character. The corolla is large, measuring 3 cm. across, white in color, glabrous, and the six individual lobes are 2 cm. in length. This is the only instance of a corolla with six lobes. Only two flowers were observed in detail, one each from *J. & M. S. Clemens 32931*, the type, and *J. & M. S. Clemens 34482*. In both cases six lobes were observed. Whether this number is uniform is questionable! According to the collectors, the stamens are "brick pink."

In this species and in *A. impressa* it is difficult to ascertain the number of cells in the fruit. In both species there is a similarity in the minute red seeds, which are so crowded in the fruit that they have penetrated the central axis, and the cell-walls appear to have been broken from the sides of the fruit. Also, in both cases, the placentae of the ovary (where it is easy to distinguish the five cells) appear blunt, with the many ovules nearly completely encircling the placentae.

In keeping with the size of the other parts of the flower, the stamens are long. The filaments are free from each other their entire length, except at their base where they are adnate to the base of the corolla. The filaments of the inner or shorter stamens are somewhat geniculate and enlarged at their juncture with the anthers. However, in the longer or outer stamens, the filaments are very straight and uniform in width.

Cited here dubiously are *J. & M. S. Clemens 32610* and *51673* collected on Mt. Kinabalu. Both specimens appear to belong to this species. However, both are specimens with smaller leaves and both are incomplete, making a true association uncertain.

52. **Adinandra plagiobasis** Airy-Shaw in Kew Bull. Misc. Inform. 1939: 504. 1939.

DISTRIBUTION: Sarawak.

SARAWAK: Mt. Dulit (Ulu Tinjar), near Long Kapa, on side of steep ridge in primary rain-forest, alt. 500 m., *P. W. Richards 1191* (ISOTYPE, A) Aug. 10, 1932 (tree 90 m. high, circumference 1.7 m. at 1.5 m. from ground, no buttresses, bark about 6 mm. thick, reddish, smooth with very numerous lenticels arranged in transverse rows, wood pale yellow; leaves gland-dotted).

Tree 27 m. high; branchlets terete, somewhat rugulose, brown, with a thin but dense pubescence, the individual hairs measuring up to 1.5 mm. in length, the terminal bud with the same pubescence. Leaves subcoriaceous, oblong-elliptic or sublanceolate, 8–12 (16, fide Airy-Shaw) cm. long, 2–3.5 cm. wide, acuminate at the apex, oblique-cordate at the base, always glabrous above, spreading pubescent beneath, densely pubescent on the younger leaves (as on the young branchlets), concentrated on the midrib, punctate-dotted, the midrib impressed above, prominent beneath, the veins inconspicuous above, more obvious beneath, ca. 15 pairs, the margin finely serrulate (evident on the lower surface only), the petiole very brief, 3 mm. or less long, the pubescence continued from the midrib. Flowers axillary, solitary; pedicels usually curved, 1.5–2 cm. long, thickened toward the apex, the pubescence similar to that of the branchlets; bracteoles 2, caducous, alternate, 3–5 mm. distant from calyx; calyx-lobes 5, imbricate, ovate, ca. 10 mm. long, 6–7 mm. wide, the outer sepals laxly pubescent, the inner sepals more densely so; corolla-lobes 5, connate at the base, obovate, ca. 13 mm. long (2 cm., fide Airy-Shaw), ca. 10 mm. wide,

sericeous on the middle portion of the external surface, glabrous within; stamens nearly 50, in series, the filaments varying in length, 2–3 mm. long, sericeous on the external surface except on the lower portion where they are adnate to the corolla-lobes, the anthers 4–6 mm. long, sericeous; ovary at first truncate then tapering at the apex rather than conical, sericeous, ca. 3 mm. diam., 5-celled, multi-ovulate, the style 8–9 mm. long, sericeous at the base, otherwise glabrous. Fruit not seen.

The oblique, cordate base of the leaves is an unusual character in this genus and the most distinguishing feature of the species. In this character and in the leaf-texture is found a striking resemblance to the species of the American genus *Freziera*. The leaves of *A. cordifolia* Ridley, from Sarawak and British North Borneo, also have a cordate base. However, as Airy-Shaw states in his presentation, the true relationship of *A. plagiobasis* is rather with *A. villosa* Choisy and *A. coarctata* Craib, which agree in indumentum and general leaf-outline. The indumentum in this species is unusual in that it is longer and more lax than the usual appressed type of pubescence found in the majority of species of the genus.

My material of *Richards 1191* is probably less copious than that from which Airy-Shaw drew his description. In the material examined here, the corolla-lobes measured only 13 mm. in length. Those described from the same number by Airy-Shaw measured 20 mm. long. I depended on a single flower for dissection, which, however, was in excellent condition.

VERNACULAR NAME: *Pungo* (Laban).

53. **Adinandra borneensis**, sp. nov.

Arbor ?; ramis teretibus, verrucosis, glabrescentibus, rubro-brunneis, ramulis teretibus, verrucosis, luteo-adpresso-pubescentibus, gemmis terminalibus dense luteo-adpresso-pubescentibus. Folia coriacea, elliptica vel obovata, 10–16 cm. longa, 4.5–6 cm. lata, apice abrupte acuminata vel subrotundata, basi cuneata, supra glabra, subtus adpresso-pubescentia, fusco-punctata, margine integra, venis supra obscura, subtus lateralibus primariis 20+ paribus, vix distinctis vel obscuris, petiolis 3–5 mm. longis, subtus pubescentibus. Flores axillares, solitarii; pedicellis circiter 2 mm. longis, adpresso-pubescentibus; bracteolis 2, alternatis, cito caducis; sepalis 5, imbricatis, circiter 10 mm. longis, inaequalibus, exterioribus duobus subrotundatis, 9–10 mm. latis, omnino adpresso-pubescentibus, interioribus tribus ovatioribus, apice subrotundatis, 8–9 mm. latis, adpresso-pubescentibus margine scariosis glabris; petalis 5, basi connatis, circiter 13 mm. longis, 9 mm. latis, omnino dense sericeis, apice rotundatis; staminibus 45–50, 4- vel 5-seriatis, 7 11 mm. longis, filamentis connatis, basi ad corollam adnatis, hirsutis, interioribus ad apicem geniculatis vel accrescentibus, exterioribus gracilibus, antheris elongatis, hirsutis, apiculatis, ovario sericeo, subgloboso, 5-loculari, multi-ovulato, stylo 5 mm. longo, glabro, stigmatibus 5-lobis. Fructus non visi.

DISTRIBUTION: Netherlands East Indies (Southeast Borneo).

SOUTHEAST BORNEO: Above Mahakam Hitaja, at sea level, *Neth. Ind. For. Serv. b.b. 20641* (TYPE, K), Feb. 1, 1936. — Above Makaham [sic], Long Loeboeng, alt. 35 m., *Neth. Ind. For. Serv. b.b. 20601* (A), Jan. 23, 1936.

This species is most closely related to another Bornean species, *A.*

myrioneura Kob., which has been collected from an approximate locality. Both have leaves with more than twenty pairs of primary veins. In the leaves of *A. myrioneura* the veins are very distinct on the under surface and rise at nearly right angles from the midrib. In *A. borneensis* the veins are quite indistinct on both surfaces and rise at a less erect angle from the midrib.

Also, *A. myrioneura* has a four-celled ovary, the style is pubescent, the corolla glabrous and the leaves are more chartaceous. In *A. borneensis*, the ovary is five-celled, the style glabrous, the corolla pubescent, and the leaves are coriaceous.

In the ovary of both species the placentae are split. In *A. borneensis* the outer cell-wall projects in between the branched placentae and extends nearly to the central axis giving the appearance of ten cells, in some instances.

Cited above is a sterile specimen collected by the Neth. Ind. For. Serv. (*20601*). The leaves are larger than those of the type. From general appearances this specimen agrees with the type and is mentioned in this paper for herbaria where perhaps the specimen may be in the flowering or fruiting stage.

54. **Adinandra dasyantha** Korthals, Verh. Nat. Gesch. Bot. ed. Temminck, 108. 1840. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève, 1: 112 (Mém. Ternstr. 24). 1855. — Miquel, Fl. Ned. Ind. 1 (2): 477. 1859; Ann. Mus. Bot. Lugd. Bat. 4: 103. 1868. — Szyszylowicz in Nat. Pflanzentam. III. 6: 189. 1893. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Netherlands East Indies (Sumatra).

SUMATRA: Exact locality lacking, *P. W. Korthals s. n.* (probable ISOTYPES, G, NY). — Tapanoeli, Angkola in Sipirok, Panoban, alt. 500 m., *Neth. Ind. For. Serv. b.b. 28194* (A), June 21, 1939. — East Coast, Asahan, vicinity of Loemban Ria, *Rahmat Si Boeea 7607* (US), Feb.-April 1935.

Tree 8 m. high; branches erect, open, terete, pale gray, glabrous; branchlets terete, densely pubescent, terminal bud densely sericeous. Leaves coriaceous, usually oblong-ovate, occasionally obovate, somewhat acute at the apex, acute at the base, ca. 10–13 cm. long, 3–4 cm. wide, the margin entire or obsoletely crenulate, glabrous above, densely pubescent along the midrib beneath, the young leaves pubescent beneath, the petiole ca. 5 mm. long, somewhat terete, flattened above, pubescent. Flowers axillary, solitary; peduncles terete, ca. 1 cm. long, thickened near the apex, pubescent; bracteoles 2, alternate near top of pedicel, caducous, pubescent; calyx-lobes 5, imbricate, subequal, rotund, ca. 6 mm. long and wide, pubescent on the external surface, membranaceous and glabrous at the margin, ciliolate; corolla-lobes 5, obovate, obtuse, densely sericeous on the external surface, glabrous within, fleshy, white, ca. 14 mm. long, 10 mm. wide; stamens in series, numerous; filaments joined at the base, partly free, linear, glabrous, the anthers oblong, acute, densely hirsute; ovary hemispherical-conical, pubescent, attenuate at the apex into a glabrous terete style; stigma truncate. Fruit glabrous, somewhat globose, attenuate at the apex into the persistent glabrous style, 5-celled, many-seeded.

Judging from the material available for study, this species appears very

rare and seems confined to the island of Sumatra. Three probable isotypes collected by Korthals in Sumatra, in addition to a single specimen collected by Rahmat Si Boeea in the East Coast region of Sumatra constitute the total material for this study.

Characters helpful in determination of the species are: (1) glabrous ovary and style; (2) glabrous filaments; (3) dense sericeous pubescence of the corolla-lobes; (4) caducous bracteoles; and (5) pubescent terminal buds, branchlets and midrib of the under surface of the leaves.

VERNACULAR NAME: *Kajoe api-api.*

55. **Adinandra myrioneura,** sp. nov.

Arbor 12 m. alta; ramis teretibus, lenticellatis, griseo-brunneis, glabrescentibus, ramulis juventutibus teretibus, sericeis, lenticellatis, gemmis terminalibus dense luteo-ferrugineis. Folia chartacea, oblongo-ovata vel oblongo-elliptica, 10–13 cm. longa, 3.5–5 cm. lata, apice late acuta, abrupte obtuseque acuminata, basi late cuneata vel subrotundata, supra glabra, subtus leviter pubescentia vel glabrescentia, margine integra vel subintegra, venis supra subobscuris, subtus prominentibus, lateralibus primariis circiter 25 paribus, a costa subperpendiculare extendentibus, ad marginem evanescentibus, petiolis pubescentibus, circiter 5 mm. longis. Flores axillares, solitarii; pedicellis 6–7 mm. longis, adpresso-pubescentibus; bracteolis 2, alternatis, cito caducis; sepalis 5, imbricatis, subrotundatis, subaequalibus, exteriore adpresso-sericeis, interiore glabris, exterioribus 5–6 mm. longis, 6–7 mm. latis, interioribus leviter latioribus, circiter 6 mm. longis, 8–9 mm. latis, margine scariosis; petalis 5, basi connatis, albidis, late obovatis, circiter 10 mm. longis, 9 mm. latis, apice rotundatis, exteriore omnino adpresso-sericeis; staminibus circiter 45, 4- vel 5-seriatis, linearibus, 6–10 mm. longis, filamentis basi ad corollam adnatis, omnino connatis, 3–6 mm. longis, dense hirsutis, medio accrescentibus, antheris exteriore dense hirsutis, oblongis, circiter 4 mm. longis, ovario subgloboso, sulcato, sericeo, circiter 4 mm. diametro, 4-loculari, multi-ovulato, placentis ramificatis, stylo circiter 5 mm. longo, glabro basi excepto. Fructus non visi.

DISTRIBUTION: British North Borneo.

BRITISH NORTH BORNEO: Tambato, Tambunan, plain, alt. 400 m., *Puasa-Angian* (Brit. North Borneo Forestry Dept. no. *3885*) (TYPE, A, K), Feb. 28, 1934 (tree 12 m. high with white flowers).

Adinandra myrioneura is outstanding because of the many primary veins on the under surface of the leaf extending nearly at right angles from the midrib, at first very distinct but gradually fading towards the margin until nearly obscure. The bracteoles are alternate and quickly caducous, dropping before anthesis. The corolla-lobes are distinct in that the sericeous pubescence is found over the entire exterior surface rather than confined to a median portion as in the majority of the species in this genus. The stamens are many, the filaments closely joined for their entire length, densely pubescent on the exterior surface, and swollen to the width of the anther at the apex. The four-celled ovary is also an unusual feature. Only three dissections were made, but all showed true 4-celled ovaries, in which the placentae were clearly branched close to the axis. The cell-wall was deeply indented opposite the point of branching.

VERNACULAR NAME: *Bangkau* (Dusun).

56. **Adinandra javanica** Choisy in Zollinger, Syst. Verz. Ind. Archip. 143, 146. 1854; in Mém. Soc. Phys. Hist. Nat. Genève 1: 112 (Mém. Ternstr. 24). 1855. — Miquel, Fl. Ned. Ind. 1 (2): 477. 1859. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Koorders & Valeton, Meded. 'S Lands. Pl. 16: 224 (Bijdr. Boomsoort. Java 3: 224). 1896. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Netherlands East Indies (Java, Lesser Sunda Islands).

JAVA: Besooki, Jang Plateau West, Taman Hidoep., alt. 1900 m., *C. G. G. J. van Steenis 10806* (A), July 13, 1938. LESSER SUNDA ISLANDS: Sumbawa, *De Voogd 1643* (A).

Small tree 10–12 m., branching low, near the ground (fide Koorders); branchlets terete, sericeous, becoming glabrous; the terminal buds densely sericeous. Leaves coriaceous, elliptical to obovate 7–10 cm. long, 3.5–5 cm. wide, usually acute at both ends, often obtusely acuminate at the apex, the margin of the upper half serrulate, pubescent when young on lower surface, along the midrib when mature, often glabrous, the petiole semiterete, 4–5 mm. long, flat on the upper surface, pubescent beneath. Flowers axillary; pedicels up to 2 cm. long, recurved, pubescent, often lightly so and near the calyx-lobes; bracteoles 2, caducous, ovate-lanceolate, 4–5 mm. long when present (fide Koorders), alternate, the lower bracteole as much as 5 mm. below the calyx-lobes; calyx-lobes 5, imbricate, subequal, very obtuse, 8–9 mm. long, densely appressed-sericeous, the narrow margin membranaceous; corolla-lobes not seen, densely sericeous on the outer surface (fide Koorders); stamens (not seen) ca. 40, connate at the base, the filaments glabrous, the anthers sericeous; ovary densely sericeous, somewhat conical, 3-celled, tapering into a densely sericeous style. Mature fruit not seen, immature fruit (ca. 1 cm. diam.) densely sericeous, 3-celled, multi-ovulate, the style densely sericeous, neither style nor fruit showing evidence of glabrescence.

The closest relative to *A. javanica* Choisy is *A. dasyantha* Korthals. Both are characterized by pubescent calyx-lobes, corolla-lobes and ovary. Also both have alternate, deciduous bracteoles. However, *A. javanica* has a densely sericeous style, and the ovary and fruit are distinctly three-celled. On the other hand, *A. dasyantha* differs in the glabrous style, the five-celled ovary and fruit.

In most Malayan and Netherlands East Indian species the presence of a three-celled ovary and fruit presages few ovules and even fewer seeds. *Adinandra javanica* appears to be one of the exceptions. The immature fruit examined shows that the developing seeds are minute and apparently many in number.

57. **Adinandra lutescens** Craib in Kew Bull. Misc. Inform. 1925: 19. 1925; Fl. Siam. Enum. 1: 125. 1925.

DISTRIBUTION: Siam, Federated Malay States (Kedah).

SIAM: Pattani, alt. 50 m., *A. F. G. Kerr 7828* (TYPE, K), Sept. 12, 1923 (shrub or small tree up to 5 m. high). Pattani, Banang Sta., evergreen forest, alt. 50 m., *A. F. G. Kerr 7274* (K), July 22, 1923 (small tree, 8 m. high).

KEDAH: Gunong Jerai, *M. Nur 9044* (K), Dec. 1925.

Shrub or small tree 5–8 m. high; branches terete, gray-brown, glabrous, the young branchlets appressed-pubescent, the terminal buds fulvous-sericeous. Leaves coriaceous or subcoriaceous, oblong-oblanceolate, 5–11 cm. long, 2.5–4 cm. wide, occasionally asymmetrical, obtusely acuminate

at the apex, cuneate at the base, glabrous, darker above, paler, lightly pubescent beneath, eventually glabrous, the margin lightly denticulate, the veins 10–12 pairs, anastomosing near the margin, the petiole 3–5 mm. long, pubescent beneath, eventually glabrescent. Flowers axillary, solitary; pedicel slender, recurved, 1.5–2.5 cm. long, thickened towards the apex, appressed-pubescent; bracteoles 2, quickly caducous, opposite, immediately below the calyx; calyx-lobes 5, imbricate, ovate, ca. 1 cm. long, 7 mm. wide, unequal, appressed-pubescent, the outer lobes broadly acute, glandular-denticulate along the margin, the inner lobes more nearly rounded, the margin membranaceous, entire; corolla-lobes 5, connate at the base, lanceolate, ca. 1.5 cm. long, 0.5 cm. wide, long-attenuate, tapering into an acuminate apex, sericeous on the median portion of the exterior surface; stamens in series, the filaments ca. 3 mm. long, adnate to the base of the corolla, joined at the base, sericeous on the apical half, the basal half glabrous, the anthers ca. 3 mm. long, densely hirsute, the apicule glabrous, 2–3 mm. long, equalling the anther-cells in length; ovary sericeous, 3-celled, multi-ovulate, tapering into the style, the style entire, sericeous diminishing in density toward the apex. Mature fruit not seen. Immature fruit somewhat globose, densely sericeous, 3-celled.

The outstanding characters of this species are: (1) long-attenuate corolla-lobes, 1.5 cm. long, 0.5 cm. wide, tapering from near the base to an acuminate apex, the sericeous area tapering also; (2) stamens ca. 9 mm. long, with the filament, anther and apicule of about equal length, the apicule unusually long for the genus; (3) bracteoles quickly caducous; and (4) ovary 3-celled, sericeous.

The closest relative is *A. phlebophylla* Hance. In the latter species the corolla-lobes are only 7–9 mm. long and, although they are acute at the apex, they do not taper gradually and continuously from the base to the apex; the stamens measure only 4–5 mm. long; the filaments are glabrous and less than a millimeter in length, the apicule rather inconspicuous; and the veins on the lower surface of the leaves tend to branch midway between the midrib and the margin.

Craib records the ovary as two-celled. Only a single dissection was made in this study on a partially developed fruit. The results showed the young fruit to be clearly three-celled.

VERNACULAR NAME: *Kandis Burong.*

58. **Adinandra oblonga** Craib in Kew Bull. Misc. Inf. **1924:** 88. 1924; Fl. Siam. Enum. **1:** 125. 1925. — Gagnepain in Fl. Gén. Indo-Chine, Suppl. **1:** 284. 1943.

DISTRIBUTION: Siam.

SIAM: Pitsanulok, Sukotai, Kao-luang, open grassy ground, alt. 1100 m., *A. F. G. Kerr 5923* (TYPE, K), May 2, 1922 (small tree about 4 m. high).

Small tree ca. 4 m. high; young branchlets terete, grayish brown, lightly and finely appressed-pubescent, the terminal bud short, conical, appressed-pubescent. Leaves coriaceous, elliptic to oblong-elliptic, 5–9 cm. long, 2.5–4.5 cm. wide, obtuse or abruptly acuminate at the apex, rounded or cuneate at the base, glabrous above, finely appressed-pubescent beneath, especially along the midrib, the margin lightly revolute when dried, glandular-denticulate, the veins 15–20 pairs, prominent on both surfaces, anastomosing freely, the petiole ca. 5 mm. long, lightly appressed-pubescent.

Flowers axillary, solitary; pedicels ca. 2 cm. long, recurved, lightly appressed-pubescent; bracteoles 2, alternate or subopposite, quickly caducous; calyx-lobes 5, imbricate, 7–8 mm. long, 5–8 mm. wide, finely appressed-pubescent, unequal, the outer lobes smaller, ovate, the inner lobes more obovate, wider; corolla-lobes 5, connate at the base, ovate, acute at the apex, 10–11 mm. long, 5–6 mm. wide, pubescent over the entire exterior surface except along the margin; stamens ca. 35, seriate, 6–7 mm. long, the filaments adnate to the base of the corolla and joined to each other, unequal, 1–2 mm. long, pubescent on the upper third, otherwise glabrous, the anthers ca. 4–5 mm. long, oblong, hirsute, the apicule ca. 1 mm. long, often as long as the shorter filaments; ovary densely appressed-pubescent, tapering into a style densely pubescent at the base, less so near the apex, the stigma 4-parted, oblique. Fruit globose, ca. 1 cm. in diameter, appressed-pubescent, 4-celled, many-seeded.

The distinguishing characters of this species useful in determination are: (1) ovary appressed-pubescent, 4-celled; (2) style densely pubescent at the base, less so towards the apex; (3) stigma 4-parted, oblique; (4) corolla-lobes ca. 1 cm. long, ovate, acute at the apex, pubescent over the entire exterior surface except along the margin; (5) stamens 6–7 mm. long, the filaments very short, 1–2 mm. long; and (6) leaves elliptic, small (up to 8 cm. long), the veins 15–20 pairs, conspicuous on both surfaces.

This species, along with *A. myrioneura* Kob. of Borneo, has a 4-celled ovary. Just how consistent this character may prove to be will depend upon the examination of future collections. In other species, such as *A. Macgregorii* Merrill from the Philippine Islands and *A. Clemensiae* Kob. from British North Borneo, where a 4-celled ovary has been noted, the character was found to be inconsistent. In *A. Clemensiae*, where a 4-celled ovary occurred quite consistently in the type-specimen, more material was available for study, and the prevailing number of cells for the ovary appeared to be five.

In *A. oblonga* the stigma is 4-parted and oblique. In *A. Macgregorii* the style was also 4-parted. Still, on the same specimen were found flowers in which the ovary was 3-celled.

In its gross characters, this species resembles *A. parvifolia* Ridley very closely, the leaves appearing almost identical. However, it can be separated by the longer pedicels, the smaller acute corolla-lobes which are pubescent over the entire external surface, the very short filaments of the stamens, and the 4-celled fruit and 4-parted stigma.

59. **Adinandra coaretata** Craib in Kew Bull. Misc. Inform. 1925: 18. 1925; Fl. Siam. Enum. 1: 124. 1925.

DISTRIBUTION: Siam.

SIAM: Betong, Gunong Ina, evergreen forest, alt. 1200 m., *A. F. G. Kerr 7559* (TYPE, K), Aug. 10, 1923 (small tree ca. 4 m. high).

Small tree ca. 4 m. high; branchlets gray-brown, terete, eventually glabrous, younger branchlets tomentulose, very young branchlets of current year's growth fulvous-pilose, the terminal buds densely fulvous-pilose. Leaves coriaceous, oblong-elliptic, 7–10 cm. long, 3–4 cm. wide, obtusely or abruptly acuminate at the apex, cuneate to somewhat rounded at the

base, glabrous above, lightly pubescent beneath, the pubescence more densely concentrated on the midrib and along the margin, conspicuously dark-dotted beneath, the margin revolute, lightly glandular-apiculate, this condition obscured by the pubescence, the veins 10–12 pairs, conspicuous on both surfaces, anastomosing near the margin, the petiole thick, 5–7 mm. long, densely pubescent on both surfaces. Flowers axillary, solitary; pedicels stout, recurved, ca. 5 mm. long, fulvous-pilose; bracteoles 2, opposite, immediately below the calyx, quickly caducous, when present ovate, ca. 3.5 mm. long, 3 mm. wide, pilose, ciliolate; calyx-lobes 5, imbricate, unequal, the outer lobes broadly ovate, 9–10 mm. long, 8–9 mm. wide, obtuse, pilose, the inner lobes ca. 13 mm. long, pilose, the margins denticulate; the ovary subconical, ca. 4 mm. long, densely sericeous, 5-celled, multi-ovulate, tapering at the apex into a sericeous style glabrous only at the apex.

Craib in his excellent description of *A. coarctata* mentions the ovary as being four-celled. I felt dubious about this character and sacrificed a developing fruit on the type-specimen to verify his finding. My single dissection showed four large well-developed cells with a fifth smaller, almost abortive cell, this latter containing developing ovules, however.

Outstanding characters in this species are: (1) bracteoles quickly caducous, when present ovate, pilose, ciliolate, ca. 3.5 mm. long and 3 mm. wide; (2) inner calyx-lobes larger (ca. 13 mm. long) than the outer lobes, pilose, denticulate along the margin; (3) ovary densely sericeous, 5-celled, with one cell smaller than the others, multi-ovulate; (4) style entire, generally sericeous, glabrous at the apex; (5) terminal buds densely fulvous-pilose; and (6) leaves with a generally thin pubescence on the under surface, the pubescence densely concentrated on the midrib and margin obscuring the glandular-apiculations along the margin.

Although the corolla-lobes and stamens have not been described for this species, from the type and distribution of the pubescence one may expect the former to be pubescent.

This species is so closely associated with *A. glischroloma* Handel-Mazzetti and its varieties of China and Indo-China that later collections may prove it to be no more than another variety in this complex. However, until these further collections are made, it is best to continue the species in its present status.

60. **Adinandra phlebophylla** Hance in Jour. Bot. **14**: 240. 1876. — Szyszylowicz in Nat. Pflanzenfam. III. **6**: 189. 1893. — Craib, Fl. Siam. Enum. **1**: 124. 1925. — Gagnepain in Fl. Gén. Indo-Chine, Suppl. **1**: 286. 1943.

Adinandra integerrima Pierre, Fl. For. Cochinchine **2**: t. 125. 1887. Non T. Anderson. — Pitard in Lecomte, Fl. Gén. Indo-Chine **1**: 334. 1910.

Adinandra integerrima T. Anderson γ *phlebophylla* (Hance) Pierre, Fl. For. Cochinchine **2**: t. 125. 1887.

DISTRIBUTION: Indo-China (Cambodia).

CAMBODIA: Prov. Tpong, Knang Repoeu, alt. 1500 m., *L. Pierre 608* (ISOTYPES, A, M, NY), May 1870 (tree 8–15 m. high).

Tree 8–15 m. high; branchlets terete, grayish brown, appressed-pubescent when very young, later glabrous, the terminal buds sericeous. Leaves coriaceous, oblong-elliptic, 8–12 cm. long, 3–4 cm. wide, obtusely acuminate

at the apex, acute at the base, glabrous above, sparsely appressed-pubescent beneath, especially along the midrib, the margin serrulate, the veins raised on both surfaces, branching midway between the midrib and the margin, the petiole ca. 5 mm. long, rounded, pubescent beneath, flat, glabrous above. Flowers axillary, solitary; pedicels 2–5 cm. long, slender, graceful, swelling in diameter near the apex, appressed-pubescent at first, later glabrescent; bracteoles 2, caducous, oblong-lanceolate when present, 4 mm. long, 2 mm. wide, densely sericeous, usually close to the calyx; calyx-lobes 5, imbricate, minute at anthesis, unequal, ca. 7–8 mm. long, 5–6 mm. wide, appressed-sericeous, especially the inner lobes, increasing at maturation of fruit to ca. 12 mm. long, 7 mm. wide, ovate, distinctly acute at the apex; corolla-lobes 5, ovate, unequal, 7–9 mm. long, 2–3 mm. wide, densely sericeous, acute at the apex; stamens ca. 30, 2- or 3-seriate, minute, 4–5 mm. long, the filaments only ca. 0.5–0.8 mm. long, joined at the base, glabrous, the anthers oblong, very densely sericeous; ovary and style elongated, only 5 mm. long over all, densely sericeous at anthesis. Fruit globose, ca. 1 cm. diameter, densely sericeous, topped by a persistent sericeous style 1.5 cm. long. Seeds minute, dark brown.

The outstanding characters of this species are: (1) corolla-lobes lightly sericeous, shorter (6–8 mm. long) than the calyx-lobes (7–9 mm. long); (2) stamens minute, ca. 3–4 mm. long, the filaments glabrous, very short (0.5–0.8 mm. long), the anthers so densely sericeous that their outline is difficult to discern; (3) pedicels sturdy, up to 5 cm. long in fruit; (4) bracteoles caducous, when present 4 mm. long; and (5) ovary, fruit and style densely sericeous.

From 1887 to 1925, this species had been considered synonymous with *A. integerrima* T. Anders. Pierre felt the two entities were identical and in his treatment of *A. integerrima* probably used the type of *A. phlebophylla (Pierre 608)* in describing and illustrating *A. integerrima* for his Fl. For. Cochinchine (2: t. 125. 1887). It is safe to assume that this specimen provided the material for both his description and illustrations, since they agree perfectly. Craib (1925), was the first to draw attention again to *A. phlebophylla* and he returned it to its specific status.

Adinandra phlebophylla is more closely allied to *A. lutescens* Craib than to *A. integerrima*. In leaf-characters these two species are almost identical. However, Craib's species has a much longer corolla (1.7 cm. long) and the filaments are approximately four times longer and more in proportion with the anthers than those in *A. phlebophylla*.

The number of cells of the ovary is not known. Even though isotypes of the species were available for this study, the material was so poor that I was not able to make dissections which would add to this knowledge.

The species is treated in this portion of the study rather than with the Chinese species since its relationships are with this group and also because of the former confusion of its association with *A. integerrima*.

61. **Adinandra villosa** Choisy in Mém. Soc. Phys. Hist. Nat. Genève 1: 112 (Mém. Ternstr. 24). 1855. — Dyer in Hooker f., Fl. Brit. Ind. 1: 283. 1874. — Kurz, For. Fl. Brit. Burma 1: 100. 1877. — King in Jour. As. Soc. Bengal 59 (2): 190 (Mater. Fl. Malay Penin. 1: 130). 1890. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Ridley in Jour. Linn. Soc. Bot. 38: 304. 1908; Fl. Malay

Penin. 1: 196. 1922. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

Ternstroemia ? sericea Wallich, Cat. no. 1454.

Schima Wallichii Choisy in Mém. Soc. Phys. Hist. Nat. Genève 1: 179 (Mém. Ternstr. 91). 1855.

Adinandra integerrima T. Anderson *β villosa* (Choisy) Pierre, Fl. For. Cochinchine 2: t. 125. 1887.

DISTRIBUTION: Malay Peninsula, Burma.

MALAY PENINSULA: Penang, Penang Hill, alt. 670 m., *E. J. H. Corner 31595* (A, K), July 21, 1936. — Perak, Larut, rocky localities in dense jungle, *Dr. King's Collector 6256* (K), July 1884 (tree 12–16 m. high; leaves glossy deep green; flowers light greenish white with a silvery gloss; fruit silvery white). — Selangor, Sempang Mines, *H. N. Ridley 15594* (K), April 1894.

BURMA: Tenasserim, Tavoy, *N. Wallich 1454* (K).

Tree 12–15 m. high; branchlets pilose, pale brown, the leaf-buds sericeous. Leaves coriaceous, oblong-lanceolate or elliptic, 10–14 cm. long, 3–5 cm. wide, shortly acuminate at the apex, rounded or broadly cuneate at the base, rarely acute, glabrous above, sparsely pubescent beneath, the margin entire or faintly crenulate, the nerves 7–9 pairs, ascending, arching within the margin, not prominent, the petiole ca. 5 mm. long, pilose. Flowers axillary, usually solitary; pedicel pilose ca. 1 cm. long, recurved, pilose; bracteoles 2, caducous, ovate, when present occurring from the middle of the pedicel upward; calyx-lobes 5, imbricate, nearly equal, broadly ovate to somewhat rounded, up to 10 mm. long and 8 mm. wide, pilose on the external surface; corolla-lobes 5, connate at the base, ovate, obtuse or rounded at the apex, densely sericeous on median portion of the external surface, glabrous at the margins; stamens ca. 30, adnate to the base of the corolla, the filaments short, sericeous; ovary depressed-hemispherical, densely sericeous, 5-celled, tapering at the apex into a densely sericeous style. Fruit 10–12 mm. diam., densely sericeous, 5-celled. Seeds numerous, minute, shiny, dark brown, ca. 1.5 mm. long.

This species has been little understood and frequently misinterpreted. My early conclusions were based on a single specimen, *Corner 31595*, in the Arnold Arboretum. However, I found myself unwilling to accept my own interpretation and made a late appeal to Kew for a secondary loan of representative authentic material of this species. To my surprise and satisfaction *Corner 31595* was included in the loan along with *Wallich 1454*, the latter specimen probably the most renowned in this species.

I was embarrassed when I realized that a psychological element had played an important part in my reluctance to accept the species at first. I mention this unscientific incident, since it may help to explain the dubious position the species has held in the past. Considering some of the very pubescent species such as *A. glischroloma* Handel-Mazzetti, I was very disappointed in the amount of pubescence on *A. villosa* when confronted with the actual type. I had expected a much more pubescent species. Although the name is appropriate, the species is hardly more villous than many other species in the same geographical locality.

All the above cited specimens are in the fruiting stage; hence complete descriptions of corolla-lobes and stamens are still wanting. King in his "Material for a Malayan Flora" gives rather a complete description of the

species and this was used in my own description of corolla-lobes and stamens.

Pierre, in his Fl. For. Cochinchine 2: t. 125. 1887, reduced this species to synonymy under *A. integerrima* T. Anders. along with *A. phlebophylla* Hance. Pitard, in Lecomte, Fl. Gén. Indo-Chine 1: 334. 1910, followed Pierre in his treatment. However, Craib, Fl. Siam. Enum. 1: 125. 1931 retained all as separate entities.

Adinandra bicuspidata, sp. nov.

Arbor parva ad 10 m. alta; ramulis teretibus, brunneis, leviter lenticellatis, glabrescentibus, hornotinis pubescentibus adpressis, gemmis dense ferrugineo-sericeis. Folia chartacea, subrotundata vel ovata, 7–12 cm. longa, 3–6 cm. lata, apice abrupte acuminata, basi late cuneata vel cuneata, supra glabra, subtus glabrescentia et leviter punctata, margine integerrima, venis undique prominentibus reticulatisque, primariis 10–12 paribus, intra marginem anastomosantibus arcuantibusque, venis secundariis brevioribus inter primarios frequentibus, petiolis ca. 1 cm. longis, supra planis glabrisque, subtus semi-teretibus, pubescentibus vel glabrescentibus. Flores axillares, solitarii; pedicellis adpresso-pubescentibus, 1–1.5 cm. longis, apice subrecurvatis; bracteolis 2, oppositis, probabiliter post anthesin caducis, ovatis, 6–7 mm. longis, 3–4 mm. latis, sericeis; sepalis 5, imbricatis, inaequalibus, late ovatis, exterioribus ca. 9 mm. longis et 8 mm. latis, apice subapiculatis, dense sericeis, interioribus minoribus; petalis (immaturis) 5, ad basim liberis vel subliberis, oblongo-ovatis, ca. 5 mm. longis et 2.5 mm. latis, dense sericeis margine exceptis; staminibus (immaturis) ca. 35, uniseriatis, ca. 2.5 mm. longis, filamentis ad basim liberis, ca. 0.75 mm. longis, glabris, antheris dense ferrugineo-sericeis, oblongis, apice bicuspidatis, loculis thecarum ultra connectivum projectis; ovario (immaturo) subplano, densissime ferrugineo-sericeo, loculorum numero ignoto, stylo (immaturo) integro, ca. 4 mm. longo, densissime omnino apice incluso ferrugineo-sericeo. Fructus ignotus.

DISTRIBUTION: Malay Peninsula (Penang).

PENANG: Government Hill, alt. 650 700 m., *C. Curtis 2241* (K, TYPE), March 1890 (small tree 25 ft. high).

Because of the incomplete material in the type specimen I was at first unwilling to describe this new species. However, after careful study it appears to be distinct from the other species in its geographical area. The material, even though incomplete, is sufficient to permit a technical description, and hence I finally have decided to include it in this study.

The name *A. bicuspidata* is derived from the bicuspidate appearance of the anthers. In some species studied, the connective projects beyond the anther cells, causing anthers to appear apiculate. In other species, the anther cells are flush with the connective, causing the anthers to appear truncate. In this new species, the anther cells project sharply above the connective, giving a bicuspidate appearance to the anthers.

Other characteristics which lend distinction to this species are: (1) the chartaceous leaves with the veins distinctly reticulate on both surfaces; and (2) the long ferrugineous pubescence of the anthers, ovary and style. The pubescence of the style is further unusual in that it extends the entire length of the style, obscuring the stigma.

In the type specimen the flowers were immature, and hence the measurements of most floral parts cited above are subject to change when more complete material is available. It appears that this species may be very rare, since it has been collected only once, and that nearly sixty years ago.

Unfortunately, the true number of cells in the ovary could not be ascertained. Although two dissections had been made, in both cases the cell-walls of the ovary were too indistinct to permit one to say with assurance just what their number might be. I am inclined to feel that the ovary is five-celled, but of that I am not certain. Because of the uncertainty of the cell number in the ovary, this species cannot be included in the key and is placed at the end of the Indo-Malaysian species.

At Kew, this species had been associated with *A. villosa* Choisy. However, the chartaceous, reticulate leaves, the bicuspidate anthers, the glabrous filaments and the opposite bracteoles all distinguish *A. bicuspidata* from the older species.

LITTLE-KNOWN SPECIES

62. **Adinandra Brefeldii** Koorders in Meded. 'S Lands. Plant. 19: 349, 642. 1898. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Netherlands East Indies (Celebes).

CELEBES: [Cited here dubiously] En Ond. Makale-Rantepao, Paniki, alt. 300 m., *Neth. Ind. For. Serv. b.b. 20271* (A), Feb. 12, 1938.

Tree 43 m. high, the trunk 105 cm. in diameter, the bark brown-gray. Leaves elliptic-oblong, decurrent at the base into a petiole 2 cm. long, the lower ⅓ of the margin entire, the remainder crenate-serrate, acute at the apex, glabrous on both surfaces, ca. 14 cm. long, 6 cm. wide (the leaves of the young shoots 30 cm. long and 11.5 cm. wide). Young parts minute appressed-puberulent. Branchlets glabrous. Peduncles 2.5–3.5 cm. long, glabrous, bibracteolate. Sepals glabrous, the margin subciliate, semi-orbicular, 5 mm. long. Fruit depressed-globose, 2.5 cm. diam. glabrous.

Adinandra Brefeldii and the following species, *A. celebica*, were offered by Koorders as new species with accompanying descriptions far too brief for satisfactory study without type-specimens. It may be that the types were also incomplete. Although both species appear to have been described from fruiting material, very little information concerning the fruit is presented.

The interesting feature in the above description (which is merely a translation of the original), is the petiole of the leaf. Koorders mentions the leaf as being decurrent into the petiole 2 cm. long. In the above-cited sterile specimen, the petiole is hardly much over 1 cm. long but the leaf-blade is decurrent into the petiole and this decurrent condition persists along the branchlet. The specimen, although sterile, evidently has been collected from a vigorous young shoot, the leaves being of considerable size.

63. **Adinandra celebica** Koorders in Meded. 'S Lands Plant. 19: 350, 642. 1898. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: Netherlands East Indies (Celebes).

CELEBES: Kandari, *O. Beccari s. n.* (K), Feb. 1883.

Tree up to 25 m. high, the trunk 45 cm. in diameter; branches and branchlets terete, glabrous, gray-brown, the terminal buds appressed-pubescent. Leaves coriaceous or subcoriaceous, obovate to obovate-elliptic, 10–12 cm. long, 3–5 cm. wide, occasionally considerably smaller, obtuse at the apex, cuneate at the base, glabrous on both surfaces, punctate-dotted beneath, the margin lightly denticulate to entire, the veins 10–12 pairs, arching upward and anastomosing near the margin, rather inconspicuous, the petiole ca. 5 mm. long, glabrous, occasionally lightly appressed-pubescent (on newly unfolded leaves). Fruit axillary, solitary; pedicel 2–2.5 cm. long (3–4 cm., Koorders), glabrous, terete, recurved near the apex; bracteoles 2, persistent, alternate below the calyx, glabrous, almost vestigial, scale-like, subdeltoid, ca. 1.5 mm. long; calyx-lobes 5, imbricate, quite glabrous, subrotund, ca. 5–6 mm. long, 6–7 mm. wide, rugulose. Young fruit glabrous, subglobose, tapering at the apex into a glabrous, entire style, 5-celled, many developing seeds.

The information offered by Koorders in his description of this species is too brief, and offers no details that might not be applied to any but the most exceptional species in the genus. He does state, however, that in the Kew Herbarium there is a specimen collected by Beccari in central Celebes which is supposedly identical with his type. From the Kew Herbarium was obtained a specimen collected by Beccari which may or may not be the specimen in question; hence it is cited here dubiously. The pedicels in the Beccari specimen measure not more than 2.5 cm., whereas Koorders records the measurements as 3–4 cm. He also states that the leaves are glabrous to the naked eye but laxly pilose under the hand-lens. The Beccari specimen is quite glabrous. However, the terminal leaf-buds are appressed-pubescent which would indicate that the very young leaves are pubescent, on the under surface at least. Only by an examination of the actual type can one expect to gain a concept of this species.

64. **Adinandra crenulata** T. Anderson ex Dyer in Hooker f., Fl. Brit. Ind. 1: 283. 1874. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Melchior in op. cit., ed. 2, 21: 144. 1925.

Ternstroemia crenulata Wallich, Cat. no. 3723, herb. Madras.

A discussion of this species is quite difficult since the only available reference is the sketchy original description by T. Anderson. A note, perhaps the original manuscript of Anderson, on an otherwise blank herbarium sheet in Kew states, "Possibly a native of the Malayan peninsula. Wallich's specimen is the only one that exists and was obtained from the Madras Herbarium and bears no locality. It is probably one of those plants collected by König during his visit to the settlements in the Malayan peninsula." Considerable doubt as to the origin of the type existed at the time of the description, and, from the literature examined, it appears that no worker has associated any material collected later with the species *A. crenulata*.

Both Szyszylowicz and Melchior in their treatments of the Theaceae in "Die Natürliche Pflanzenfamilien" incorporated this species in their work.

Unfortunately, the original description of the species is such that it

might be applied to any number of species in the Malayan region. Because of this lack of a single distinctive feature, and the fact that the type is in Madras rather than in one of the Malayan herbaria, its true identity has been lost and will continue to be until opportunity can be afforded some worker to study the type.

Ridley 4801, deposited in the U. S. National Herbarium and collected in the Singapore Garden Jungle, may belong to this species. The distinguishing feature of this specimen is the decided crenulation of the leaf-margin. It is not a good specimen. There are no terminal buds and the partially developed fruits are in rather poor condition. It was originally identified as *A. maculosa* T. Anders.

DOUBTFUL SPECIES

65. **Adinandra cordata** Choisy in Mém. Soc. Phys. Hist. Nat. Genève 1: 112 (Mém. Ternstr. 24). 1855.

This species, mentioned only once and then doubtfully by Choisy, is based upon a reported species by Gaudichaud from the Hawaiian Islands. There has been no other record of *Adinandra* from the Hawaiian Islands since that time, hence one is led to believe that Choisy erred in his generic designation. The subsessile cordate leaves lead one to believe that Choisy may have had in mind *Eurya sandwicensis* A. Gray. This is merely a supposition, since no material has been available for this study. However, Choisy's brief description does apply for the most part to specimens examined of *E. sandwicensis*.

66. **Adinandra sylvestris** Jack in Malay Misc. 2 (7): 3. 1822 [repr. in Calcutta Jour. Nat. Hist. 4: 208. 1843; et in Miscel. Papers Indo-China II. 2: 295, 302. 1887].

The knowledge of this species is very limited. In Misc. Papers Indo-China is reproduced the original description. There, on p. 295, *Adinandra sylvestris* is described as "Bacca trilocularibus. Suka beranak. Malay. A large forest tree at Moco Moco." On p. 302 of the same volume, Sir J. D. Hooker, in a note to the editor states, "Adinandra sylvestris. *Not taken up by later authors.* — Sûka bĕrának — i. e., fond of having children."

EXCLUDED SPECIES

Adinandra Miquelii King in Jour. As. Soc. Bengal 59 (2): 192 (Mater. Fl. Malay Penin. 1: 132). 1890 = **Ternstroemia bancana** Miquel, Fl. Ned. Ind. Suppl. 1: 477. 1862.

Adinandra bancana (Miquel) King ex Durand & Jackson, Index Kew. Suppl. I (Add. & Emend. II): 401. 1906 = **Ternstroemia bancana** Miquel, Fl. Ned. Ind. Suppl. 1: 477. 1862.

This species was originally described as *Ternstroemia bancana* by Miquel in 1862. In 1890, King, thinking the species an *Adinandra,* transferred it to the latter genus under the name *A. Miquelii.* Later, Ridley (Fl. Malay Penin. 1: 197. 1922) treated the species under its original genus and name, *Ternstroemia bancana* Miquel. In the meantime, Durand and

Jackson (1906) had made still another combination, *Adinandra bancana*, erroneously attributing the binomial to King.

AFRICAN SPECIES

Two species of *Adinandra* have been described from Africa. The first species, *A. Mannii* Oliver (1868), was collected on St. Thomas Island off the west coast of Africa in the Bay of Guinea, and the second species, *A. Schliebenii* Melchior (1934), was collected in Tanganyika Territory in eastern Africa, a span of nearly the whole African continent separating the two entities. It appears from the literature that both species have been collected only once. Although these two species differ considerably in many features from the Indo-Malaysian and Papuan groups, on the other hand they possess many interesting characteristics in common with the latter and are closely related. Among the outstanding characters in which they differ from the other groups are: (1) stamens in a single series, the filaments glabrous, free except at the very base, the anthers glabrous, subsagittate; and (2) corolla-lobes three times longer (35–50 mm.) than the calyx-lobes, connate at the base only, otherwise free, disposed in a pseudo-tube, the apices of the lobes arching over the pistil and stamens.

Szyszylowicz (1893) created a section, Eleutherandra, for *A. Mannii* based on the free filaments and supposedly separating this species from all other species of *Adinandra*. Melchior (1925) continued this section of Szyszylowicz and in 1934 added to the section the species *A. Schliebenii*. This character, if meant to separate these two species from all others, is not well chosen, since nearly every species in China must be included. The most outstanding characters to my mind are the glabrous subsagittate anthers and the corolla-lobes arranged in a tube.

No formal key is necessary to separate here these two species. Their differences are mentioned in detail in the discussion following the description.

67. **Adinandra** Mannii Oliver in Fl. Trop. Afr. 1: 170. 1868. — Hooker, Icon. Pl. 11: 29, t. 1039. 1867. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 189. 1893. — Melchior in Notizbl. Bot. Gart. Mus. Berlin 8: 657. 1924; 11: 1100. 1934; in Nat. Pflanzenfam. ed. 2, 21: 144. 1925.

DISTRIBUTION: West Africa (Island of St. Thomas).

GULF OF GUINEA: Island of St. Thomas, summit of the peak of the island, *G. Mann 1066* (ISOTYPE, G).

Tree 10 m. high: branches gray, terete, glabrous, the young branchlets red-brown, glabrous, terete, minutely tuberculate-punctate, the terminal buds glabrous. Leaves chartaceous to subcoriaceous, oblong-elliptic to oblong-obovate, quite uniform in size, 6–7 (–9) cm. long, 2–3 cm. wide, acuminate at the apex, asymmetrical, subrotund at the base, glabrous on both surfaces, the midrib reddish near the base, tuberculate-punctate on the lower surface, the margin glandular-denticulate, the veins 15–18 pairs, conspicuous but not prominent, anastomosing midway to the margin, the petiole 1–2 mm. long. Flowers axillary, ? solitary; pedicel ca. 2 cm. long

(fide Oliver), glabrous; bracteoles 2, persistent, glabrous, opposite, immediately below the calyx, broadly ovate, 7–8 mm. long, 5–6 mm. wide, acute at the apex, carinate; calyx-lobes 5, imbricate, glabrous on the exterior surface, very lightly appressed-pubescent (with binocular) on the interior surface, broadly ovate, acute at the apex, unequal, the two outer lobes 12–14 mm. long, ca. 10 mm. wide, the three inner lobes 17–19 mm. long, ca. 10 mm. wide, their inner margins scarious, entire; corolla-lobes 5, slightly connate only at the very base, not spreading, somewhat tubuliform, oblong, ca. 25 (35–45) mm. long, 7–10 mm. wide, obtuse to subrotund at the apex; stamens ca. 30 in a single series, equal, ca. 8 mm. long, the filaments glabrous, ca. 4 mm. long, adnate to the base of the corolla, otherwise free, the anthers oblong-linear, equalling the filaments in length, strictly glabrous, the apicule less than 0.5 mm. long, truncate to emarginate; ovary conical-ovoid, glabrous, ca. 4 mm. diam., tapering into the style, 4-celled, multi-ovulate, the placentae bifid, the style glabrous, entire, ca. 22 mm. long, the stigma 4-lobed. Fruit not seen.

The outstanding characters which separate this and the following species, *A. Schliebenii* Melchior, from the rest of the genus are: (1) anthers glabrous; (2) filaments glabrous, free their entire length except at the very base, at which point they are joined together as well as adnate to the base of the corolla; and (3) corolla-lobes linear-oblong, connate at the base only, but connivent their entire length presenting a tube-like appearance.

The characters which separate *A. Mannii* from *A. Schliebenii* are: (1) inner calyx-lobes glabrous and entire; (2) corolla-lobes subrotund at the apex; (3) bracteoles longer, measuring 7–8 mm. in length; (4) ovary and style glabrous; and (5) stamens only about half as long (8 mm.) and more numerous (30).

68. **Adinandra Schliebenii** Melchior in Notizbl. Bot. Gart. Mus. Berlin 11: 1076, 1097. 1934.

DISTRIBUTION: East Africa (Tanganyika Territory).

NO SPECIMEN SEEN.

Tree 20–30 m. high; very young branchlets smooth, compressed, glabrous, red to gray-brown. Leaves chartaceous to coriaceous, obovate-oblong, 5–10 cm. long, 2–3.5 cm. wide, acute at the apex or shortly and obtusely acuminate, cuneate at the base, glabrous on both surfaces, the midrib red beneath, the margin serrulate-dentate, glandular, the veins conspicuous beneath because of the red color, the petiole ca. 5 mm. long. Flowers axillary, solitary, ca. 3 cm. long; pedicels 2.5–3.5 cm. long, recurved, glabrous; bracteoles 2, persistent, opposite, immediately below the calyx, glabrous, broadly ovate, acute at the apex, carinate, the outer 3 mm. long and wide, the inner 5 mm. long and wide; calyx-lobes 5, imbricate, ovate, acute at the apex, unequal, varying in length from 10 mm. (outer lobe) to 17 mm. (inner lobe), ca. 12 mm. wide, the two outer lobes glabrous on the exterior surface, the three inner lobes sericeous on the exterior surface except along the scarious margins, ciliolate; corolla-lobes 5, free, twice as long as the innermost calyx-lobe, linear-oblong, 32–45 mm. long, 5–7 mm. wide, acute at the apex, somewhat narrowed and connate at the base, not spreading, somewhat tubuliform; stamens 15–20, uni-seriate, ca. 15 mm. long, glabrous, the filaments free (inter se), adnate

to the base of the corolla, filiform, 8–9 mm. long, the anthers linear, ca. 5 mm. long, cordate-sagittate at the base, the connective projected at the apex into a small subulate-lanceolate apicule 1 mm. long; ovary conical, ca. 6 mm. long, 4 mm. wide, sericeous-tomentose, imperfectly 5-celled, multi-ovulate, attenuate at the apex into a filiform style 24–30 mm. long, sericeous along the lower portion, glabrous along the upper portion, lightly 5-sulcate, the stigma minute, lightly 5-sulcate. Fruit indehiscent, conical-ovoid, ca. 2 cm. long, 1 cm. wide, the seeds many, small, reniform, 1.2–1.5 mm. diam., brown, shining, reticulate.

This species has been described so minutely that it can be separated easily from the preceding species, even though the type has not been seen. It is fortunate, since the type may not be in existence any longer.

Adinandra Schliebenii Melchior was collected by H. J. Schlieben in Tanganyika Territory in eastern Africa, far removed from the Island of St. Thomas in the Bay of Guinea where *A. Mannii* was collected.

According to Melchior, the type specimen is numbered 3175 and was found growing on the northwest side of the Uluguru Forest in Morogoro (Tanganyika Terr.), at an altitude of 1900 m. The flowers are orange and red in color. On December 28, 1932, the plant was in both flower and fruit.

The characters separating this species from *A. Mannii* are: (1) inner calyx-lobes pubescent and ciliolate; (2) corolla-lobes acute at the apex; (3) bracteoles unequal and shorter, measuring 3 and 5 mm. in length; (4) ovary and lower half of the style sericeous; and (5) stamens twice as long, measuring 15 mm. in length, and less in number (15–20).

VERNACULAR NAME: *Msungu* (Kiliguru).

PAPUASIAN SPECIES

To date, three species have been described from New Guinea, *A. Forbesii* Baker, *A. Brassii* Kobuski, and *A. calosericea* Diels. The last named species has been transferred to the new genus *Archboldiodendron*, which is midway between *Gordonia* and *Adinandra* in characters. The styles in *Archboldiodendron* are free, very short, and recurved, resembling those of *Gordonia*. In wood-structure the genus resembles *Adinandra*. It is not known as yet whether the fruit is dehiscent or indehiscent. From the appearance of the ovules one would not expect the seeds to be winged.

The first two species mentioned above belong, according to the collector, L. J. Brass, among the very large trees of New Guinea. They are closely related to each other and are separated from the Indo-Malaysian species by their large, fleshy purple corolla-lobes and their very numerous (50–60), long, densely pubescent stamens, in very definite series. The characteristics separating the two species from each other are noted in the discussions following their descriptions.

69. Adinandra Forbesii Baker f. in Jour. Bot. 61: Suppl. 4. 1923. Kobuski in Jour. Arnold Arb. 21: 152. 1940.

DISTRIBUTION: British New Guinea.

BRITISH NEW GUINEA: Sogeri region, Mt. Gawada, *H. O. Forbes 545* (TYPE, Brit. Mus. Nat. Hist.; ISOTYPE, K), 1885–1886.

Large tree; branchlets gray, terete, glabrous, the terminal buds appressed-pubescent. Leaves coriaceous, ovate-oblong, 5–8 cm. long, 2.8–3.5 cm. wide, acute or broadly acute at the apex, cuneate at the base, glabrous on both surfaces, the margin flat, lightly serrulate, the veins 8–10 pairs, conspicuous on the lower surface, less so on the upper surface, anastomosing and arching upward near the margin, the reticulations quite conspicuous, the petiole up to 10 mm. long, glabrous. Flowers axillary, solitary; pedicel up to 4.5 cm. long, glabrous, conspicuously lenticellate; bracteoles 2, persistent, opposite, immediately below the calyx, broadly ovate or deltoid, ca. 1.5 mm. long, lightly appressed-pubescent; calyx-lobes 5, imbricate, recurved even in the bud, semi-orbicular, ca. 5 mm. long and wide, lightly appressed-pubescent or glabrescent; corolla-lobes 5, connate at the base, fleshy, glabrous, 15–20 mm. long, 12–14 mm. wide, scarious at the margin; stamens ca. 56, 5-seriate, 10–14 mm. long, filaments only lightly adnate to the base of the corolla, connate, densely sericeous on the exterior surface, and the upper half of the interior surface, the anthers lightly hirsute, oblong, subequal, 4–5 mm. long; ovary globose, glabrous, ca. 5 mm. long, 6 mm. wide, attenuate at the apex into an entire style, 5-celled, multi-ovulate. Fruit not seen.

Adinandra Forbesii can be separated from *A. Brassii* by the following characters: (1) leaves oblong-elliptic, acute at both ends, conspicuously veined on the under surface; (2) pedicels up to 4.5 cm. long, glabrous, covered with many conspicuous lenticels; (3) bracteoles opposite; (4) corolla-lobes glabrous; and (5) calyx-lobes recurved, even in the bud.

This species is closely related to *A. Brassii* and has many characteristics in common with it, especially in the floral parts. In both species the corolla-lobes are fleshy, the calyx-lobes hardly more than 5 mm. long and thinner than the corolla-lobes, the stamens are conspicuously 5-seriate, long (up to 15 mm.), and densely sericeous.

According to Baker, Szyszylowicz, and later, Melchior, the stamens are described as "pentadelphous" or in "five-bundles." True, they vary in length according to the series but are not distinctly in bundle formation. They appear joined in a single tube. Perhaps, in drying or in boiling they may be broken up into groups, but my study showed them more characteristically in an unbroken tube-formation.

70. **Adinandra Brassii** Kobuski in Jour. Arnold Arb. 21: 150. 1940.

DISTRIBUTION: New Guinea.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, rain-forest, *L. J. Brass 7856* (TYPE, A), Sept. 1936 (very large tree with thick scaly bark; flowers purple). — Wuroi, Oriomo River, Western Division, riverine rain-forest, alt. 5–10 m., *L. J. Brass 5874* (A, NY), Feb. 2, 1934 (large heavy-boled, spreading tree with flaky-scaly brown bark and tough brown wood; leaf apex subretuse and margin much recurved, especially near the base; flowers purple, pendent beneath leaves). NETHERLANDS NEW GUINEA: Two kilometers s. w. of Bernhard Camp, Idenburg River, frequent on slopes of primary rain forest, alt. 850 m., *L. J. Brass & C. Versteegh 13176* (A), March 19, 1939 (tree 29 m. high, diam. 43 cm., the crown not wide-spreading, the bark 13 mm. thick, black, scaly, fairly rough, the sap-wood red-brown, the heart-wood violet). — Six kilometers s. w. of Bernhard Camp, Idenburg River, frequent tree of primary forest, on slope of ridge, alt. 1200 m., *L. J. Brass & C. Versteegh 12519* (A), Feb. 15, 1939 (tree 28 m. high, diameter 55 cm., crown not wide-spreading, the bark 8 mm.

thick, brown fairly smooth, the sap-wood light brown, the heart-wood violet; flowers dark red; fruit green when young, red when mature).

Very large trees up to 30 m. high; branchlets gray, terete, glabrous, appressed-pubescent at the very tip, the terminal bud appressed-pubescent. Leaves thick-coriaceous, obovate to subrotund, (4–) 7–11 cm. long, (2.5–) 4–6 cm. wide, subrotund and subemarginate at the apex, cuneate to rounded at the base, the upper surface glabrous, shining, the lower surface glabrescent, the margin subrevolute with a few inconspicuous glands, the veins 15–20 pairs, inconspicuous on the lower surface, the petiole glabrous, 5–7 mm. long. Flowers axillary, solitary or in pairs; pedicel appressed-pubescent or glabrescent, free from lenticels, 3–3.5 cm. long; bracteoles 2, persistent, below the calyx, subopposite or alternate, broadly deltoid, ca. 1.5 mm. long, 2.5 mm. wide, puberulent; calyx-lobes 5, imbricate, broadly ovate to subrotund, 4–5 mm. long, 5–6 mm. wide, obtuse or rounded at the apex, lightly appressed-pubescent; corolla-lobes 5, lightly connate at the base, purple, fleshy, 15–20 mm. long, 14–16 mm. wide, appressed-pubescent on the external surface, scariose at the margin; stamens 55–60, 5-seriate, 10–15 mm. long; filaments only lightly adnate to the base of the corolla, 6–11 mm. long, connate, densely sericeous on the exterior surface, the anthers hirsute, oblong, subequal, 3–4 mm. long; ovary globose, glabrous, ca. 6 mm. long, 7 mm. wide, gradually attenuate into the entire style, 5-celled, the placentae prominently 2-branched, recurved with many ovules attached. Fruit globose, red, glabrous, up to 3 cm. long.

Adinandra Brassii is listed by Brass as one of the large trees of New Guinea. It is a very distinctive species characterized by thick, dark, scaly bark, light brown or red-brown sap-wood and purple heart-wood. The corolla-lobes are purple, and much more fleshy than the Malayan and Chinese species; the calyx-lobes, on the other hand, are smaller and thinner.

Adinandra Brassii can be separated from *A. Forbesii,* its closest relative and the only other species known at present from New Guinea, by its obovate or subrotund leaves which are not oblong, the much less conspicuous veining, and the fine appressed-pubescent corolla-lobes.

When first described this species appeared very outstanding because of the densely hirsute anthers and filaments. Since Baker, in describing *A. Forbesii,* did not mention pubescence on either the corolla-lobes or the stamens, I assumed them both to be glabrous. An examination of the type of *A. Forbesii* showed, as far as the corolla-lobes were concerned, this assumption to be correct. However, the stamens (both anthers and filaments) are so densely sericeous that they appear to be the most noticeable characteristic of the flower.

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THE CYPERACEAE COLLECTED IN NEW GUINEA BY L. J. BRASS, I*

S. T. Blake

With four text-figures

This is the first contribution to an account of the specimens of Cyperaceae collected in New Guinea chiefly by Mr. L. J. Brass during the Archbold Expeditions between 1933 and 1939. Included also in the treatment are some other specimens from New Guinea and the Solomon Islands from various collections. I am particularly grateful to Prof. Elmer D. Merrill, of the Arnold Arboretum, for the opportunity to study the Brass collection, and to Dr. Lily M. Perry for copies of much literature unavailable to me. To Mr. A. J. Jessep and Mr. J. H. Willis I am indebted for the loan of specimens and literature from the National Herbarium of Victoria, Melbourne (cited as herb. Melbourne), and to Mr. W. Hartley for the loan of a set of the specimens collected by Mr. C. E. Carr, now in the herbarium of the Council for Scientific and Industrial Research, Canberra (cited as herb. Canberra).

Unless otherwise indicated, the type-specimens of new species are in the Queensland Herbarium, Brisbane (herb. Brisbane) and duplicate-types in the Gray Herbarium of Harvard University, Cambridge, Mass.

The present paper deals with the genus *Carex,* and in this genus I have received valuable help from Mr. E. Nelmes, of the Herbarium, Royal Botanic Gardens, Kew, England, who has been studying the Malaysian and Australasian species of the genus for some years. The arrangement of species here follows that in Kükenthal's well-known monograph in Das Pflanzenreich IV.20. 1909, but some variations of his treatment have been found necessary at this later date. The specimens have been critically compared with copious Australian material, but the comparison with Malaysian material has been much less extensive and considerable reliance has had to be placed on descriptions alone.

Carex L.

Subgen. **Primocarex** Kükenth.

Carex eremostachya sp. nov. (Sect. *Circinatae* Meinsh. sensu Kükenth.). Fig. 1, A.

Rhizoma repens circiter 1.5 mm. crassum squamis tenuibus brunneis opacis tenuiter striatis obtectum. Culmi approximati vel laxe caespitosi,

* Botanical Results of the Richard Archbold Expeditions.

circiter 20–25 cm. alti, graciles flaccidulique, acute triquetri admodum compressi, scabri. Folia pauca culmum superantia, inferiora ad vaginas brunneas integras redacta, 3–4 superiora laminifera; laminae acutae, usque ad 20 cm. longae, 2–2.5 mm. latae, planae, glabrae, inferne laeves sursum nervis marginibusque scabrae, carinatae ceterum obscure nervosae. Spica unica, erecta, androgynaecea, ebracteata, 10–12 mm. longa, 5 mm. crassa, oblonga, pluri- et densiflora, variegata, pars mascula linearis circiter 4–5 mm. longa. Glumae femineae ovatae acute acuminatae, 3.5–4 mm. longae, glabrae, dorso obtuse carinato 3-nerves, lateribus rubro-brunneae. Utriculi suberecti, 4.5 mm. longi, 1.2 mm. lati, membranacei, pallide viridescentes, elliptici, rostrati, acutiuscule triquetri, glabri laevesque, prominule circiter 15-nerves, basin versus angustati brevissime stipitati, sursum in rostrum circiter 1.5 mm. longum gracile lineare triquetrum glabrum laeve ore firmo bidentatum (dentibus strictis acutis) subsensim contracti. Nux utriculo

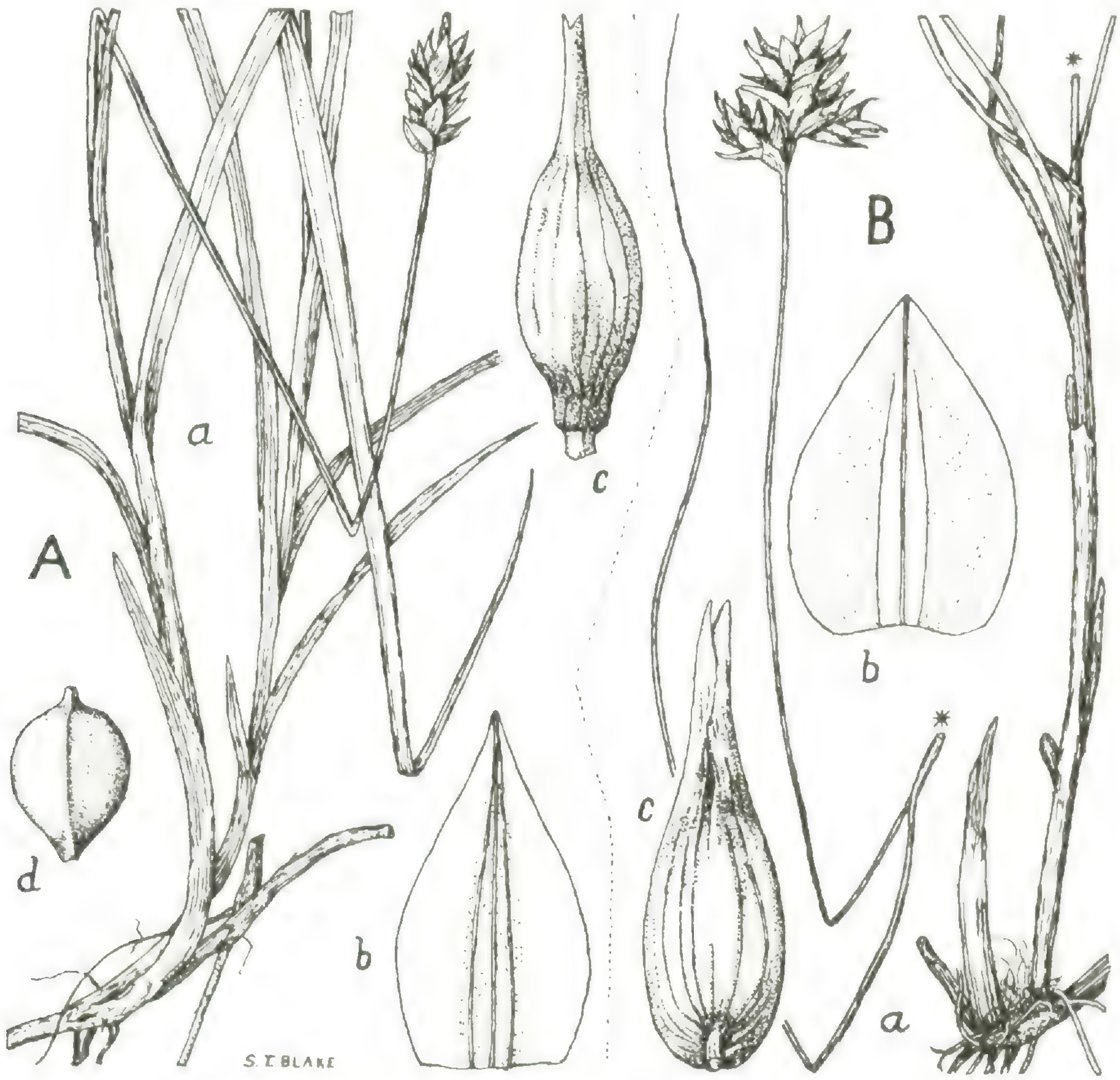

FIG. 1. A. *Carex eremostachya* S. T. Blake: *a*. part of plant with fruiting culm, × 1; *b*. pistillate glume, flattened out, × 10; *c*. utricle, dorsal view, × 10; *d*. nut, × 10. B. *Carex perileia* S. T. Blake: *a*. part of plant with fruiting culm, × 1; *b*. pistillate glume, flattened out, × 10; *c*. utricle, dorsal view, × 10. All figures from type-specimens.

brevior et subaequilata, 1.8 mm. longa, 1.2 mm. lata, oblonga subobovoidea, obtusissima sed brevissime acuminato-apiculata, basi subacuta, valde triquetra angulis prominulis, lateribus fere plana. Stylus basi haud incrassatus; stigmata 3.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass 10255* (TYPE), October 1938, alt. 2800 m., massed on open beaches of small stream in forest.

This species is most nearly allied to *C. rhizopoda* Maxim., from Japan, differing in the more densely-flowered female part of the spike with broader reddish brown (not green) glumes, the nut more obtuse at each end, and perhaps also in the shorter male part of the spike. Ohwi, in Mem. Coll. Sci. Kyoto Imper. Univ. ser. B, 11(5): 443. 1936, has erected a new section *Rhizopodae* Ohwi for *C. rhizopoda*, but *C. eremostachya* appears to agree better with the characters of the *Circinatae*, under which Kükenthal arranged *C. rhizopoda* in Pflanzenr. IV.20: 98. 1909. *C. eremostachya* also appears to be closely allied to *C. Petelotii* Gross, but to judge from the description the latter has a narrower spike but longer utricles (5–6 mm.). No mention is made of a rhizome.

Carex capillacea Boott, Illustr. 1: 44, *t. 110*. 1858.
Carex rara Boott subsp. *capillacea* (Boott) Kükenth. in Pflanzenr. IV.20: 102. 1909.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9085*, August 1938, alt. 3225 m., scattered along grassy shores of lake; 11 km. northeast of top of Mt. Wilhelmina, *Brass & Myer-Drees 9751*, Sept. 1938, alt. 3400 m., in wet grassy valley.

Not previously recorded from New Guinea; known to extend as far north as Sakhalin and Manchuria and west to Sikkim, and known to occur in southeastern Australia. *Brass 9085* has a short setaceous bract half as long as the spike.

Subgen. **Vignea** (Beauv.) Nees

Carex appressa R. Br. Prodr. 242. 1810; Kükenth. in Bot. Jahrb. 69: 261. 1938; Ohwi in Bot. Mag. Tokyo 56: 214. 1942.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9248*, August 1938, alt. 3225 m., gregarious on wet low shores of lake, erect in clumps to 1.5 m. high.

Previously recorded for Netherlands New Guinea by Ohwi, l. c., and for Northeast New Guinea by Kükenthal, l. c.; elsewhere known from Australia, New Zealand and its dependencies, and New Caledonia.

Carex curta Gooden. in Trans. Linn. Soc. Lond. 2: 145. 1794.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9037*, August 1938, alt. 3225 m., common on marshy flats; Lake Habbema, *Brass 9119*, August 1938, alt. 3225 m., moist burnt-over ground in a native camp; Lake Habbema, *Brass 9539*, August 1938, alt. 3225 m., open grassland, plentiful on wet sandy soil.

Not previously recorded for New Guinea, but widely spread in Europe, Asia, North and South America, and southeastern Australia.

This species has commonly been called *C. canescens* L., but E. S. Marshall has shown, in Jour. Bot. 45: 365. 1907, that the type of Linnaeus is a specimen of quite a different plant, commonly known as *C. Buxbaumii* Wahlenb., and that the present plant has to be called *C. curta* Gooden. This view is followed by Nelmes in Proc. Linn. Soc. Lond. 155 sess.: 284.

1944. The confusion seems to have arisen with the misidentification by Lightfoot, Fl. Scotica 550. 1777, and has been perpetuated by such authorities as Bentham (e.g. in Handb. Brit. Fl. 2: 913. 1865, and in Fl. Austral. 7: 439. 1878), Boeckeler (in Linnaea 39: 122. 1875), C. B. Clarke (in Hook. f. Fl. Brit. Ind. 6: 706. 1894), Kükenthal (in Pflanzenr. IV.20: 216. 1909), Ohwi (in Mem. Coll. Sci. Kyoto Imper. Univ. ser. B, 11(5): 268. 1936), Mackenzie (in N. Am. Fl. 18: 374. 1935), and Duman (in Catholic Univ. Am. Biol. Ser. 36: 44. 1941). F. N. Williams, when discussing the European varieties of *Carex canescens* in Jour. Bot. 46: 369–376. 1909, agreed with Marshall's interpretation, but continued to use the name *C. canescens* in the traditional sense with the remark that "I think that all doubt is cleared away by citing Lightfoot as the authority." But this practice is contrary to the International Rules of Nomenclature, particularly Arts. 16, 18, 46 and 47.

Carex perileia sp. nov. (Sect. *Elongatae* Kunth). FIG. 1, B.

Rhizoma stoloniforme tenue. Culmi caespitosi, gracillimi, compresse trigoni, striati, glabri, laeves, usque ad medium foliati, quoad visi 20 cm. alti. Folia pauca culmum superantia, flexuosa, angustissima, conduplicata (explanata circiter 1 mm. lata), marginibus superioribus scaberula, ima ad vaginas persistentes pallidas redacta. Inflorescentia subcapitata, ovata, densa, brunnea, circa 1.5 cm. longa lataque; bracteae squamiformes, ima breviter aristata. Spicae 3 (quoad visae) approximatae, sessiles, gynaecandrae parte masculina perbrevi, obovatae vel oblongae, squarrosae, 7–10 mm. longae, 7–8 mm. latae. Glumae femineae ovatae, acutae, muticae vel fere muticae, carina angusta 1–3-nervi virides, lateribus enervibus brunneae vel rufo-brunneae nitidae, marginibus anguste albae subscariosae, 3–3.5 mm. longae. Utriculi patuli, 5 mm. longi, 1.4 mm. lati, fulvescentes viridi-marginati, omnino glabri laevesque, epunctulati, elliptici, membranacei, basi rotundata incrassati, plano-(subconcavo-) convexi, nervis 2 marginalibus conspicuis, nervis tenuioribus latere plano circiter 7 latere convexo circiter 10 notati, sursum in rostrum latiusculum complanatum leviter incurvum breviter bidentatum omnino laeve glabrumque purpureo-tinctum cetero utriculo subaequilongum dorso anguste sulcato profunde fissum subsensim contracti. Nux utriculum implens, 2 mm. longa, 1.2 mm. lata, oblongo-ovata, plano-convexa. Stigmata 2.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9583* (TYPE), August 1938, alt. 3225 m., marshy shores of lake

The specimen seen has a single fruiting culm. The species is very close to some forms of *C. echinata* Murr. (*C. stellulata* Good.), but has narrower leaves and longer utricles with a relatively longer beak deeply split on the back and with entirely smooth margins. The split on the back usually appears as a narrow brown furrow, as the result of the overlapping of the edges.

Subgen. **Indocarex** Baill.

Carex Dietrichiae Boeck. in Flora 58: 122. 1875.

SOLOMON ISLANDS: San Cristobal: Waimamura, *Brass 2660*, August 1932, lowlands on pathways and in open swampy places in the rain-forests, plentiful (inflorescence brown).

Previously known to me with certainty only from Queensland. Kükenthal, in Pflanzenr. **IV.20**: 264. 1909, regards *C. Dietrichiae* Boeck., *C. fissilis* Boott, and *C. indica* L. var. *Milnei* C. B. Clarke as synonymous, treating the group as *C. indica* var. *fissilis* (Boott) Kükenth. *Carex Dietrichiae* differs from *C. indica* L. in having shorter awns to the bracteoles, bright brown (not pallid) male glumes, and less spreading, less turgid utricles less abruptly constricted into their beaks. Mr. Nelmes informs me that *C. fissilis* has much longer pistillate glumes than *C. Dietrichiae*.

I have not seen the specimens referred to *C. indica* var. *Milnei* by Ridley in Trans. Linn. Soc. II. Bot. 9: 247. 1916, nor those referred to *C. indica*

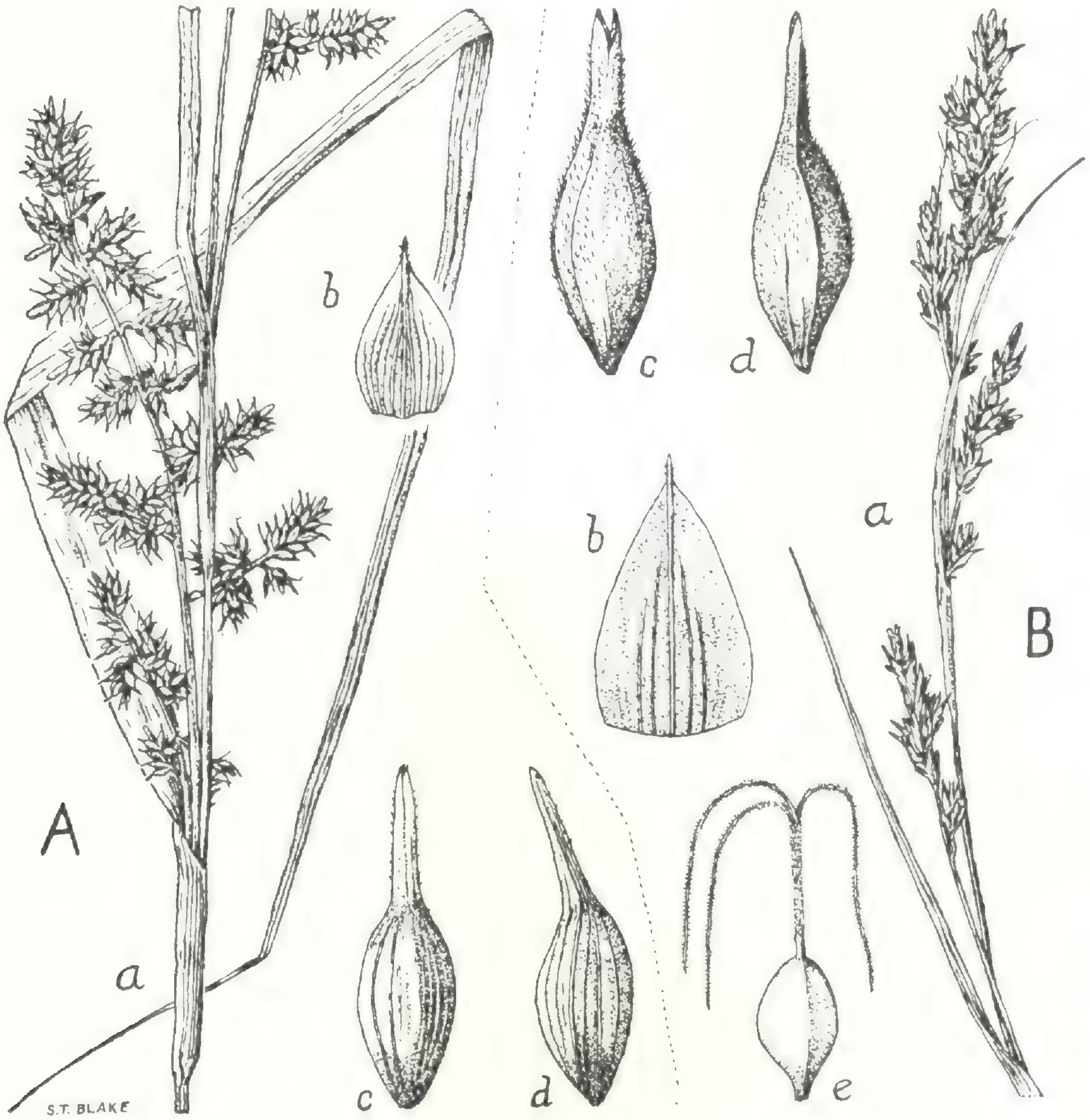

FIG. 2. A. *Carex lamprochlamys* S. T. Blake: *a*. part of middle region of inflorescence, × 1; *b*. pistillate glume, flattened out; × 10; *c, d*. utricle, dorsal and lateral views, × 10. B. *Carex melanophora* S. T. Blake: *a*. upper part of inflorescence, × 1; *b*. pistillate glume, flattened out, × 10; *c, d*. utricle, dorsal and lateral views, × 10; *e*. nut with style, × 10. All figures from type-specimens.

var. *fissilis* by Kükenthal in Bot. Jahrb. 59: 59. 1924. The specimen from New Guinea referred to *C. fissilis* by F. Mueller in Trans. Roy. Soc. Vict. 1(2): 36. 1889 belongs to *C. continua* C. B. Clarke.

Carex lamprochlamys sp. nov. (Sect. *Indicae* Tuckerm.). FIG. 2, A.

Herba robusta circa 75 cm. alta. Culmi subvalidi, acute triquetri, uninodes, glabri laevesque. Folia summam inflorescentiam haud attingentia, in apicem filiformem longe attenuata, acuta, 7–10 mm. lata, crebre striata, carinata, marginibus revoluta, supra scaberrima, subtus scabra, omnia laminifera, inferiora vaginis sanguineo-fuscis plus minusve persistentibus. Panicula plus quam dimidium culmum occupans, 7–8-nodis, composita, linearis, fere continua. Bracteae longe vaginantes vaginis pallidis ampliatis prope os antice puberulis, inflorescentiam superantes, foliiformes, summae filiformes. Paniculae secundariae 12, singulae vel binae, oblongo-ovatae laxiusculae, erectae, exserte pedunculatae, plerumque 5–9 cm. longae et 2–3.5 cm. latae. Pedunculi erecti, exserti, graciles, rigidi, striati, scaberuli. Rhachis scaberrima. Bracteolae emarginatae, arista scabra longe aristatae. Spicae pallidae ferrugineo-tinctae, androgynaeceae, oblongae vel ovoideae, plerumque 6–8 (raro 5) mm. longae, circa 5 mm. latae, parte mascula partem femineam adaequante vel ea breviore. Glumae femineae fulvae, ovatae, acutae admodum acuminatae, aristulatae, pluristriatae, circiter 2 mm. longae. Utriculi pallidi, nitidi, membranacei, 3–3.5 mm. longi, 1 mm. lati, trigoni haud inflati, nervis prominulis circiter 15 notati, inferne elliptici vel obovati basi contracti, glabri laevesque, sursum in rostrum gracile planum fere rectum vel leviter excurvum ore integrum oblique sectum marginibus admodum scabrum cetero utriculo aequilongum subabrupte contracti. Nux 2 mm. longa, 0.9 mm. lata, brunnea, ellipsoidea utrinque acuta, triquetra, apice indistincte annulata, lateribus concava, basi breviter stipitata. Stylus basi incrassatus; stigmata 3.

PAPUA: Central Division: Mafulu, *Brass 5323* (TYPE), Sept.–Nov. 1933, alt. 1250 m., common erect ground plant in *Castanopsis* forest; Boridi, *Carr 13160*, Sept. 1935, alt. ca. 4700 ft., young secondary forest (herb. ca. 2 ft. tall) (herb. Canberra).

Kükenthal cited Brass's collection under *C. Rafflesiana* Boott var. *continua* (C. B. Clarke) Kükenth., in Bull. Jard. Bot. Buitenz. III. 16: 315. 1940, and Carr's collection under *C. indica* L., in Bot. Jahrb. 69: 262. 1938. The species differs from *C. indica* L. and its immediate allies (subsect. *Turgidulae* Kükenth.) in that the utricle is not olivaceous, is by no means inflated, and is gradually attenuated into its beak, and differs further from *C. indica* itself in that the pistillate glumes are only shortly aristate. From *C. Rafflesiana* and its allies (subsect. *Hispidulae* Kükenth.) it differs in the stouter more rigid panicle and in that the utricle is but sparsely scabrous and then only on the narrow beak. By reason of the non-inflated utricle not abruptly narrowed into its slender only slightly scabrous beak, this species seems best placed in subsect. *Gracilirostres* Kükenth., but it is readily distinguished by its pallid shining mature utricle. Carr's specimen is a somewhat immature plant with a culm about 50 cm. high and leaves about 7 mm. wide.

Carex continua C. B. Clarke in Hook. f. Fl. Brit. Ind. 6: 717. 1894.

Carex Rafflesiana Boott var. *continua* (C. B. Clarke) Kükenth. in Philip. Jour. Sci. 6: 60. 1911, in Bot. Jahrb. 59: 59. 1924, in Bull. Jard. Bot. Buitenz. III. 16: 315. 1940.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13211,* March 1939, alt. 850 m., rain-forest, one clump on river-bank; 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13722,* March 1939, alt. 850 m., occasional tufts on open banks of rain-forest stream; 15 km. southwest of Bernhard Camp, Idenburg River, *Brass 12371,* Jan. 1939, alt. 1500 m., rain-forest, one clump in sandy stream-bed; 18 km. northeast of Lake Habbema, Bele River, *Brass 11225,* Nov. 1938, alt. 2300 m., Fagaceae forest, common in moist hollows, clumps 50 cm. high. PAPUA: Central Division: Near summit of Owen Stanley Range at 9200 ft., *W. MacGregor* (herb. Melbourne); Mt. Tafa, *Brass 4842,* May–September 1933, alt. 2400 m., plentiful on roadside in forest; Mt. Tafa, *Brass 5007,* May–September 1933, alt. 2400 m., common roadside species, also found occasionally on forest floor, Mt. Tafa, *Brass 5088,* alt. 2400 m., May–September 1933, scattered on thinly vegetated face of an old landslip.

Not previously recorded for Netherlands New Guinea. *Brass 5007* was cited by Kükenthal, in Bull. Jard. Bot. Buitenz. III. 16: 315. 1940, under *C. Rafflesiana* Boott var. *continua* (C. B. Clarke) Kükenth. Kükenthal also cites *Brass 5323, 4391,* and *4623* as belonging to this form; of these *Brass 5323* serves as the type of the abundantly distinct *C. lamprochlamys* S. T. Blake, while nos. *4391* and *4623* are referred below to *C. neoguineensis* C. B. Clarke. MacGregor's specimen was referred to *C. fissilis* Boott by F. Mueller, in Trans. Roy. Soc. Vict. 1(2): 36. 1889.

Kükenthal's earlier opinion that *C. continua* C. B. Clarke is specifically distinct from *C. Rafflesiana* Boott seems preferable to treating it as a variety of the latter. The specimens seen from New Guinea and the Philippine Islands seem to form a homogeneous series. The species extends to the eastern Himalayas.

Carex neoguineensis C. B. Clarke in Jour. Linn. Soc. Bot. 37: 12. 1904, in Kew Bull. Add. Ser. 8: 73. 1908; Kükenth. in Pflanzenr. IV.20: 280. 1909, in Bot. Jahrb. 59: 59. 1924; Suring. in Nova Guinea Bot. 8: 713. 1912; Ridl. in Trans. Linn. Soc. II. Bot. 9: 246. 1916.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9210,* August 1938, alt. 3225 m., associated with *Sphagnum* and grasses in shrubby edges of forest; 9 km. northeast of Lake Habbema, *Brass 10882,* October 1938, alt. 2650 m., wet bank of an open stream in forest; 9 km. northeast of Lake Habbema, *Brass 10925,* October 1938, alt. 2800 m., common on wet sandy soil of openings in forest. PAPUA: Central Division: Mt. Albert Edward, *Brass 4391,* May–July 1933, alt. 3600 m., small colony on an open grassland slope (inflorescence brown); Mt. Victoria, *W. MacGregor* in 1889 (herb. Melbourne); Murray Pass, Wharton Range, *Brass 4623,* June–September 1933, alt. 2840 m., common on grasslands and recently burnt areas (leaves pale green, inflorescence brown); lower regions of British New Guinea, *W. MacGregor* in 1894 (herb. Melbourne).

The specimens cited show some variation between one another, particularly as to the size of the utricle. *Brass 9210* and *4623* have small utricles 2.5–2.8 mm. long, while on *Brass 10882* and *MacGregor's* specimens the utricles are 2.7–3.5 mm. long with longer more slender beaks. The type-specimen is described as having utricles 3 mm. long with the beak prominently toothed at the tip. All our specimens have an entire or emarginate tip of the utricle. Mr. E. Nelmes does not mention this character, but tells me that apart from the size and rather stouter beak the utricle of *Brass 9210* is rather similar to that of the type and that the glumes are much alike. In view of the variation on Brass's specimens I

now have no hesitation in referring all the above-cited specimens to Clarke's species.

MacGregor's specimens have coarser leaves up to 10 mm. wide and the partial panicles sometimes paired, but the material is rather scrappy.

As mentioned in the discussion following *C. continua* above, *Brass 4623* and *4391* were determined by Kükenthal as *C. Rafflesiana* Boott var. *continua* (C. B. Clarke) Kükenth. *Carex neoguineensis* is undoubtedly closely allied to *C. continua*, but it has more loosely flowered spikes with the utricles more abruptly contracted into a more slender trigonous prominently decurved beak, while the shorter stiffer leaves and bracts (the former usually not exceeding the base of the inflorescence, the latter only about as long as the partial panicles) and the shortly aristulate to muticous bracteoles give a different *facies* to the species.

Carex melanophora sp. nov. (Sect. *Indicae* Tuckerm. subsect. *Hispidulae* Kükenth.). FIG. 2, B.

Herba stolonifera usque ad 4 dm. alta; stolones graciles usque ad 2.5 mm. crassi, squamis brunneis vel fuscis persistentibus obtecti. Culmi solitarii vel caespitosi, graciles, enodes, obtuse trigoni, striati ceterum laeves vel fere laeves, glabri. Folia prope basin culmi conferta, numerosa, recta, summam inflorescentiam fere attingentia, 2–3 mm. lata, apicem triquetrum versus longe attenuata, pro majore parte plana vel marginibus recurvula, conspicue carinata, crebre nervosa, costa supra appresse scabro-pubescentia ceterum glabra, marginibus (mediis exceptis) scaberula, carina sursum scabra, emortua persistentia; vaginae atropurpureae vel fuscae tandem in fibras dissolutae. Panicula composita, ½–⅔ plantae occupans, linearis, densa, basi interrupta. Paniculae secundariae 14, plerumque binae, fuscae, oblongae vel anguste oblongae, dense spiciformes, plerumque 1–2.5 cm. longae, 5–7 mm. latae, superiores subsessiles approximatae, inferiores prominule pedunculatae, ima plus minusve distans solitaria. Bracteae paniculas secundarias suas (interdum etiam inflorescentiam totam) superantes, superiores setaceae, inferiores foliiformes longiuscule vaginantes vaginis arctis antice tenuiter breviterque pubescentibus. Bracteolae squamiformes, aristatae, plus minusve hispidae. Pedunculi filiformes, erecti, scabri, imus usque ad 8 cm. longus. Rhachis scabra. Spicae androgynae, subapproximatae, appressae, oblongae, 4–6 mm. longae, 2–2.5 mm. latae; pars mascula partem femineam circa adaequans sed (utriculis circumdata) inconspicua. Glumae femineae sanguineo-fuscae, ovatae, acutae, muticae vel plus minusve cuspidatae, 2.5–3 mm. longae, tenuiter 5-nerves, carina tenui straminea. Utriculi fusci vel sanguineo-fusci, erecti, 3.5–3.8 mm. longi, 0.9–1 mm. lati, elliptici, utrinque angustati, subaeque subacuteque trigoni, nervis 6–8 tenuibus (quorum interdum 2 solis conspicuis) notati, appresse scabro-pubescentes, marginibus hispiduli, in rostrum sensim abeuntes; rostrum rectum cetero utriculo aequilongum vel fere aequilongum, subgracile, compressum, ore albo-marginato profunde bidentatum (dentibus strictis), marginibus scabrum. Nux arcta, elliptica, stipitata, conspicue apiculata, acute triquetra lateribus concava, stramineo-brunnea, 1.6 mm. longa, 0.8 mm. lata. Stylus basi haud incrassatus; stigmata 3.

NETHERLANDS NEW GUINEA: North slopes of Mt. Wilhelmina, *Brass & Myer-Drees 10046*, Sept. 1938, alt. 3950 m., wet places in alpine grassland, common; northern

slopes of Mt. Wilhelmina, *Brass & Myer-Drees 10080,* Sept. 1938, alt. 3950 m., alpine grassland, matted on a rock; Mt. Wilhelmina, 7 km. northeast of top, *Brass & Myer-Drees 9828* (TYPE), Sept. 1938, alt. 3560 m., abundant on moist grassy cliffs.

Carex melanophora is evidently close to *C. sarawaketensis* Kükenth., but differs in the nodeless smooth stems, smaller partial panicles, smaller spikes, longer and perhaps more distinctly nerved utricles which are scabrous rather than hispid except on the margins of the beak, and perhaps also in the development of stolons. The three collections cited above are unlike each other at first glance, but they are indistinguishable as to their spikelets and appear to reflect differences of habitat. All specimens show at least a piece of a stolon. The type-sheet consists of two pieces 3 and 4 dm. high with narrow partial panicles the lower of which are distant and long-peduncled. *Brass & Myer-Drees 10080* consists of tiny plants up to 5 cm. high; they are immature but evidently represent starved plants. The third collection is intermediate with plants 7–13 cm. high, not quite mature, with fairly dense inflorescences with the lower partial panicles shortly pedunculate and thicker than in the type. The utricles are somewhat larger than in the type, 4–4.5 mm. long and 1.1–1.2 mm. wide. It would appear that the usual length of the utricle of the species varies from 3.5 to 4.2 mm.

Carex rhizomatosa Steud. in Zoll. Verz. Ind. Archip. 60: 1854; Kükenth. in Bot. Jahrb. 59: 60. 1924, 69: 264. 1938, in Bull. Jard. Bot. Buitenz. III. 16: 316. 1940.

PAPUA: Central Division: Mafulu, *Brass 5318,* Sept.–Nov. 1933, alt. 1250 m., common amongst tall grass of deforested spurs.

This collection differs from the general run of the species in the somewhat smaller nearly smooth utricles 2.5 mm. long. It was previously cited by Kükenthal in Bull. Jard. Bot. Buitenz., l. c. The species ranges from Assam and Burma to New Guinea.

Subgen. **Eucarex** Coss. & Germ.

Carex Gaudichaudiana Kunth, Enum. 2: 417. 1837; Ohwi in Bot. Mag. Tokyo 56: 215. 1942.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9234,* August 1938, alt. 3225 m., common on marshy banks of streams; Mt. Wilhelmina, 7 km. northeast of top, *Brass & Myer-Drees 9923,* Sept. 1938, alt. 3700 m., few plants on boggy grasslands.

The specimens are small and immature, corresponding to var. *humilior* Kükenth. in Pflanzenr. IV.20: 313. 1909, which was recorded for Northeast New Guinea in Bot. Jahrb. 69: 264. 1938. To judge from the range of variation seen in Australian plants this small state is not worth taxonomic recognition. The species occurs in southeastern Australia (including Tasmania) and New Zealand and was recently recorded for Netherlands New Guinea by Ohwi, l. c.

Carex phacota Spreng. Syst. 3: 826. 1826; Ohwi in Bot. Mag. Tokyo 56: 214. 1942.

PAPUA: Eastern Division: Summit of Mt. Dayman (herb. Melbourne, without further data).

New for Papua; recorded by Ohwi, l. c., for Netherlands New Guinea, otherwise known from Nepal and Japan to Java. The sheet carries an old

herbarium label marked in the handwriting of F. Mueller "Carex Summit of Mt. Dayman," to which J. H. Willis has added "New Guinea (ca. 1894)."

Carex euphlebia sp. nov. (Sect. *Acutae* Fries). FIG. 3, C.

Herba dense caespitosa rhizomate brevi. Culmi caespitosi, cum inflorescentia 30–65 cm. alti, graciles, acute triquetri, sursum scabridi, usque ad medium foliati, basi vaginis nigricantibus nitidulis obtecti. Folia coriacea, inflorescentiam longe superantia, 2.5–5.5 (pro more 3–5.5) mm. lata, in apicem acutum fere planum scabrum longe attenuata, plerumque plana sed marginibus scaberrimis plus minusve recurva vel revoluta, nervis primariis scabra; vagina summa perlonga, inferiores persistentes, intermediae tandem in fibras plus minusve reticulatas fissae. Bracteae evaginantes, 2–3 inferiores foliiformes inflorescentiam superantes, ceterae breviores, summae squamiformes. Pedunculi capillares, tenaci-flexiles, angulis scabri, imus usque ad 5 cm. longus. Spicae 10–14, singulatim dispositae, vix distantes, lineari-cylindricae, atro-fuscae, densiflorae, inferiores pedunculatae plus minusve nutantes, superiores subsessiles patulae; terminalis mascula, interdum basi breviter feminea, 5–12 mm. longa; ceterae androgynae, 2–6 (plerumque 3–5.5) cm. longae, 4.5–5 mm. crassae, in $\frac{1}{4}$–$\frac{1}{2}$ partem superiorem masculam, circiter 1.5 mm. crassam, abrupte angustatae. Glumae femineae violaceo-nigrae, dorso viridulo 3-nerves, margine angustissime albo-hyalinae, 1.5–1.8 mm. longae, oblongo-ovatae, plus minusve obtusae, cuspide plana scabra glumam fere adaequante vel ea breviore praeditae. Utriculi pallide brunnei, glumam superantes vel multo superantes, 1.8–2.2 mm. longi, 0.9–1 mm. lati, tandem divaricati, biconvexi, elliptici utrinque acuti vel apice breviter subacuminati, ore minute truncati vel emarginati, 14–16-costati, sursum punctulati ceterum laeves, glabri. Nux utriculo brevior aequilata, elliptica, biconvexa, brunnea, circiter 1.4 mm. longa. Stylus exsertus; stigmata 2.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass 10877* (TYPE), October 1938, alt. 2650 m., common on open banks of a stream; 9 km. northeast of Lake Habbema, *Brass 10559*, October 1938, alt. 2800 m., few scattered clumps in stony bed of stream; 9 km. northeast of Lake Habbema, *Brass 10734*, October 1938, alt. 2800 m., common about native huts on open banks of stream, etc., clumps 50–60 cm. high. PAPUA: Central Division: Mt. Albert Edward, *Brass 4386*, May–July 1933, alt. 3800 m., amongst coarse tussock grass on deforested slope (stiff sedge in broad spreading tussocks).

Brass 4386 was determined by Kükenthal, in Bot. Jahrb. 69: 264. 1938, as *C. Graeffeana* Boott, from which it differs in the narrower leaves, fewer shorter coarser spikes, and rather longer utricles acute at the base and with more numerous nerves. It appears to be closely allied to *C. Pandanus* Ohwi, in Bot. Mag. Tokyo 56: 214. 1942, from Netherlands New Guinea, but has much longer leaves with more persistent sheaths, commonly cuspidate glumes, and darker coloured, rather smaller, elliptical (not obovate) utricles punctulate in the upper part. It is also close to *C. philippinensis* Nelmes, in Kew Bull. 1938: 109. 1938, differing in that the terminal spike is usually male, in the rather more slender spikes, in the ovate rather than obovate glumes, and in the smaller elliptic (not obovate) smooth paler coloured utricle which is less obtuse at the base.

On the type specimen, selected as such because of its full maturity,

there are 13 spikes and the glumes are muticous or shortly pointed. *Brass 10734* measures 22 cm. to the top of the inflorescence and has 10 spikes rather shorter than those on the type (up to 3.5 cm. long), with which it otherwise agrees. *Brass 4386* is similar to the type in appearance, but is not quite so mature; it carries 10 spikes and the glumes are rather prominently awned. *Brass 10559*, also with 10 spikes, is immature, and the uppermost spike has a few female flowers at the base.

Carex montivaga nom. nov.

Carex bulbostylis Kükenth. in Bot. Jahrb. 69: 264. 1938; non Mackenzie in Bull. Torr. Bot. Club 42: 617. 1915.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9032*, August 1938, alt. 3225 m., common on wet sandy soil of open ridges; Lake Habbema, *Brass 9339*, August 1938, alt. 3225 m., common on sandy patches on wet grassy slopes; Lake Habbema, *Brass 9582*, August 1938, alt. 3225 m., alpine grassland, tufted in a sandy pool; 11

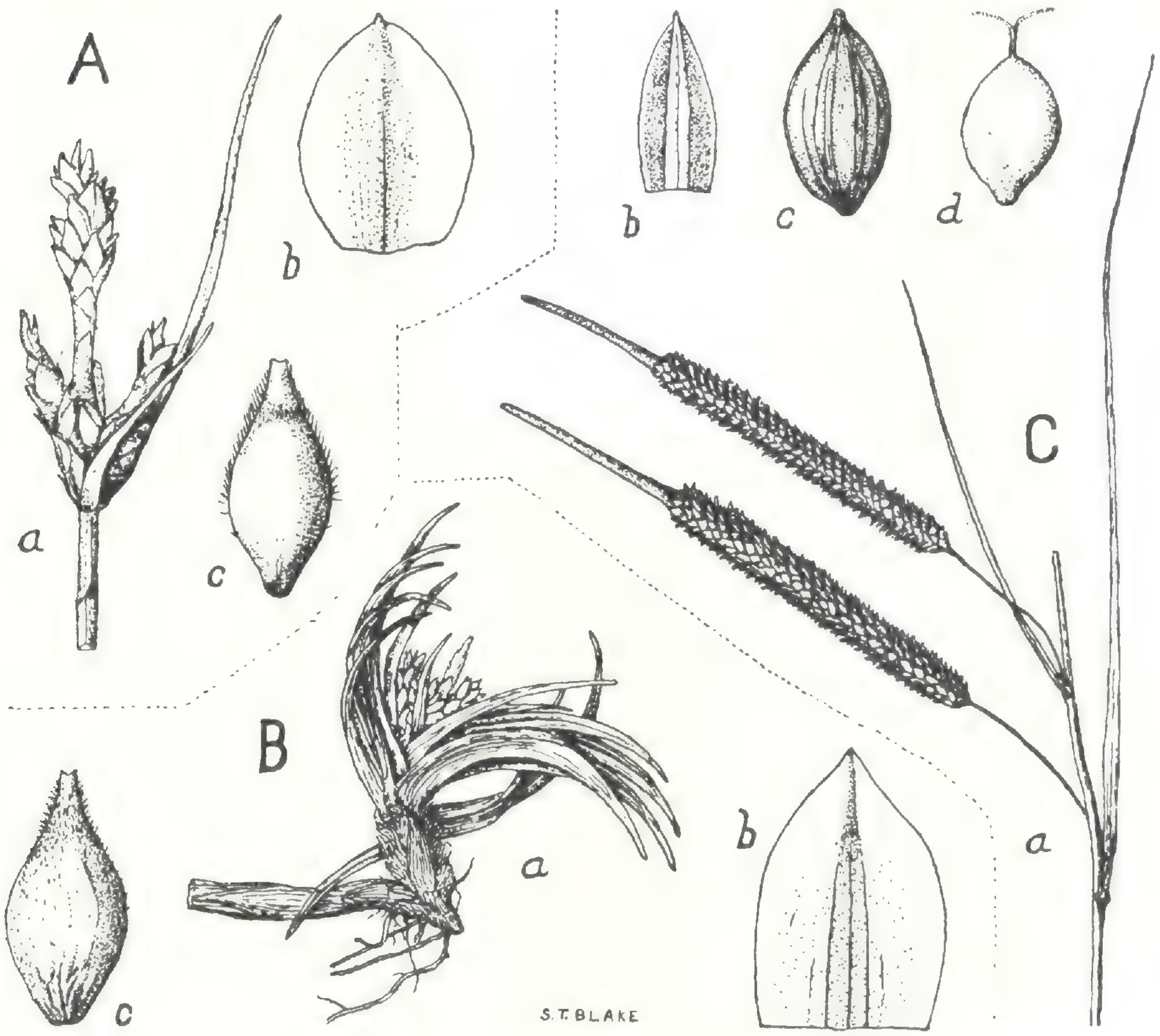

FIG. 3. A. *Carex tricholoma* S. T. Blake: *a*. apex of culm with inflorescence, × 2; *b*. pistillate glume, flattened out, × 10; *c*. nut, × 10. B. *Carex brevis* S. T. Blake: portion of plant, × 1; *b*. pistillate glume, flattened out, × 10; *c*. utricle, dorsal view, × 10. C. *Carex euphlebia* S. T. Blake: *a*. portion of middle part of inflorescence, × 1; *b*. pistillate glume, flattened out, × 10; *c*. utricle, dorsal view, × 10; *d*. nut with style, × 10. Fig. A, *a* from *Brass 4274*; remainder from type-specimens.

km. northeast of top of Mt. Wilhelmina, *Brass & Myer-Drees 9759*, Sept. 1938, alt. 3450 m., in small bog.

Kükenthal based his species on part of *Clemens 6069*, from Sarawaket in Northeast New Guinea. I have not seen the material, but the specimens cited above, particularly *Brass 9339*, agree so well with the description that there seems no doubt they are conspecific. The following notes on these specimens may be regarded as an amplification of the original description: Culms 18–42 cm. high; spikes 3–4, the terminal one male and 8–12 mm. long, the others female and up to 12 mm. long (8–12 mm. on Brass's specimens, 6–10 mm. on the type); the lowermost bract occasionally has a very short sheath; and the utricles vary from 3 to 3.6 mm. long.

Carex tricholoma sp. nov. (Sect. *Mitratae* Kukenth.). FIG. 3, A.

Carex bulbostylis Kükenth. var. *ciliato marginata* Kükenth. in Bull. Jard. Bot. Buitenz. III 16: 318. 1940, in Bot. Jahrb. 70: 464. 1940; non *C. ciliato marginata* Nakai.

Rhizoma breve. Culmi caespitosi, circa 15–30 cm. alti, graciles, trigoni, striati, prope apicem subtiliter scabri vel laeves, prope basin foliati. Folia omnia laminifera, culmo multo breviora, rigida, suberecta, sursum gradatim angustata sed apice ipsa anguste praemorsa, conspicue carinata, marginibus recurva ceterum plana, prope apicem triquetra, carina et marginibus et facie superiore scabra; vaginae brunneae, hirtellae, emortuae in fibras reticulatas dissolutae. Bractea ima inflorescentiam adaequans, angusta sed vix setacea, breviter vaginans, ceterae breves vel squamiformes. Spicae 3–4, brunneae, contiguae vel ima breviter distans, sessiles vel breviter pedunculatae, interdum etiam spica basali longissime pedunculata addita; terminalis gynaecandra, clavata, circiter 10–12 mm. longa, inferne circiter 1.5 mm. sursum 3–4 mm. crassa; laterales femineae, oblongo-cylindricae, 7–10 mm. longae, circiter 3 mm. crassae, densiflorae. Glumae femineae 2–2.3 mm. longae, late ovatae, obtusae vel fere obtusae, muticae vel cuspidulatae, brunneae, dorso pallidae subtiliter 1-nerves, marginibus anguste hyalinae. Utriculi glumam brevissime superantes, 2.3–2.5 mm. longi, 0.95 mm. lati, membranacei, straminei nervis valde obscuris, marginibus lateralibus manifeste ciliati, faciebus glabri laevesque, elliptici, trigoni angulis lateralibus conspicuis, in rostrum breve conicum brunneum ore fulvescente minute bidentulum marginibus ciliatum sensim contracti. Nux cinerea, 1.5 mm. longa, 0.9 mm. lata, oblongo-ovalis obtuse trigona, anguste tricostulata, lateribus convexa, sub apice annulata constricta. Stylus brevissimus, basi pyramidalis; stigmata 3.

PAPUA: Central Division: Mt. Albert Edward, *Brass 4274*, May–July 1933, alt. 3680 m., few plants amongst grass on banks of a grassland pond; Mt. Albert Edward, *Brass 4316* (TYPE), May–July 1933, 3680 m., sporadic in forest glades, not common.

Carex tricholoma differs from *C. montivaga* S. T. Blake (*C. bulbostylis* Kükenth. non Mackenzie) in the broader more scabrous leaves, prominently sheathing lowermost bract, gynaecandrous terminal spike, and in the smaller very shortly beaked utricle prominently ciliate on the lateral margins nearly throughout its length. Kükenthal founded his variety solely on *Brass 4316* and I have accepted a specimen of this number as the type of the species described above, but the excellent specimen *Brass 4274* was found useful in elucidating some of the details.

A small plant in herb. Brisbane collected by M. S. Clemens on Mt. Sarawaket, at 9–13000 ft. in April 1937, may belong to this species, but the specimen is not sufficiently satisfactory for definite determination.

Carex brevis sp. nov. (Sect. *Mitratae* Kükenth.). FIG. 3, B.

Carex bulbostylis Kükenth. var. *hispidula* Kükenth. in Bull. Jard. Bot. Buitenz. III. 16: 318. 1940, in Bot. Jahrb. 70: 464. 1940; non *C. hispidula* Gaud.

Herba humilis caespitosa; rhizoma oblique descendens lignosum. Culmi (inflorescentia inclusa) circiter 2–5 cm. alti, sub inflorescentia vaginis foliorum obtecti, basi admodum incrassati. Folia multa, rigida, patula vel admodum decurva, stricta vel plus minusve curva culmis multo longiora, sensim acutata, transversim secta plerumque V-formia, apice triquetra angustissime obtusa, 2–5.5 cm. longa, 3–4 mm. lata, valde striata, inferne carina marginibusque dense subtiliterque scabra, sursum undique scabra; vaginae brunneae tandem in fibras plus minusve reticulatas dissolutae. Bracteae foliiformes inflorescentiam superantes, conspicue vaginantes, vaginis antice admodum pubescentes, superiores angustiores. Spicae 4 approximatae, breviter pedunculatae, erectae, pallide brunneae vel fulvescentes; terminalis mascula linearis 7–8 mm. longa, 1.5 mm. lata; laterales femineae, singulae, oblongae, 5.5–8 mm. longae, circiter 3 mm. latae, subdensiflorae, interdum spicis basalibus longepedunculatis additis. Pedunculi graciles scaberuli. Glumae femineae tenuiter membranaceae, 2.4–2.5 mm. longae, 1.8 mm. latae, ovatae, obtusae vel acutae, muticae, concavae, dorso lutescenti tenuiter 3-nerves vix carinatae, lateribus hyalinae fulvo-tinctae; glumae masculae plus minusve acutae, inferiores carina scabrae. Utriculi fulvi, coriacei, 2.5–2.6 mm. longi, 1.15 mm. lati, obscure nervati (nervis lateralibus saepe etiam 2 alioribus prominulis), apice basique exceptis undique dense hispiduli, elliptici, obtuse trigoni, basi leviter rotundati, sursum in rostrum brevissimum conicum ore hyalinum sensim contracti. Nux straminea, 1.5 mm. longa, 0.9 mm. lata, ovoidea, obtusa, sub apice annulata abrupte constricta, subtiliter 3-costata, lateribus fere plana. Stylus basi pyramidalis; stigmata 3.

PAPUA: Central Division: Mt. Albert Edward, *Brass 4418* (TYPE), May–July 1933, alt. 3680 m., common in small tufts on a barren rocky ridge crest (leaves very stiff).

Described by Kükenthal as a variety of *C. bulbostylis* Kükenth. non Mackenzie (*C. montivaga* S. T. Blake), but it differs greatly from that species in appearance, in the stiffer broad leaves, included culms, sheathing bracts, pedunculate female spikes with muticous glumes (usually not muticous in *C. montivaga*), and rather shorter very shortly beaked densely hispidulous yellowish utricles. The rhachilla is well developed and is sometimes so long as to be exserted from the utricle when it bears another utricle, sometimes well developed, sometimes rudimentary. At times the glumes appear cuspidate due to the inrolling of their upper margins.

In Bull. Jard. Bot. Buitenz. III. 16: 318. 1940, Kükenthal cites three collections under his *C. bulbostylis* var. *hispidula*, namely *J. & M. S. Clemens 29005* and *Clemens 32344* from Borneo and *Brass 4418*, without designating the type. In the same year, in Bot. Jahrb. 70: 464, the same description is given, but the collections are cited as follows:

"Südöstl. Neu-Guinea: Mt. Albert Edward (Brass n. 4418!).
Area: Brit. Nordborneo, Mt. Kinabalu (Clemens n. 29005!; 32344!)."

Under these circumstances we may consider that in the latter publication Kükenthal emphasised that *Brass 4418* represented his variety, so that this may be regarded as the type of his trinomial. I have not seen the Clemens specimens. In any case the type of the binomial *C. brevis* is the sheet of specimens of *Brass 4418* in herb. Brisbane.

Carex breviculmis R. Br. Prodr. 242. 1810; Ridl. in Trans. Linn. Soc. II. Bot. 9: 247. 1916.

Carex breviculmis R. Br. subsp. *Royleana* Nees ex Wight sensu Kükenth. in Bull. Jard. Bot. Buitenz. III. 16: 318. 1940, in Bot. Jahrb. 70: 464. 1940.

PAPUA: Central Division: Murray Pass, Wharton Range, *Brass 4697*, June Sept. 1933, alt. 2840 m., pale species scattered on grassland slopes.

I do not see how these specimens differ from the general trend of the species in Eastern Australia, unless the utricles are somewhat less pubescent. The length of culm varies considerably, sometimes even on the same plant, and evidently has no taxonomic importance in this species. I have seen no authentic specimen of subsp. *Royleana*, which is said to have somewhat scabrous culms; the other characters described are to be found in characteristic *C. breviculmis*.

Carex constricta sp. nov. (Sect. *Frigidae* Fries subsect. *Decorae* Kükenth.). FIG. 4, A.

Herba pygmaea caespitosa stolonifera phyllopoda. Culmus 4 cm. altus, intra folia absconditus et horum vaginis obtectus. Folia numerosa, culmum superantia, usque ad 5 cm. longa, 2–3 mm. lata, plana, sensim acuta, perrigida, carinata, sursum carina marginibusque scabra; vaginae purpurascentes diu integrae sed tandem in fibras fissae. Inflorescentia e spicis 6 erectis constructa; spica terminalis mascula linearis circiter 7 mm. longa et 1.2 mm. crassa, breviter pedunculata; spicae laterales femineae, ima excepta geminatae, oblongae, subdensiflorae, 5–11 mm. longae, sub fructu 3.5–4 mm. crassae, breviter pedunculatae pedunculis e vaginis haud vel vix exsertis. Bracteae inflorescentiam superantes, foliiformes, prominule vaginantes. Glumae femineae oblongo-ovatae, truncatae vel bilobae, aristulatae, carina angusta basi 3-nervi virides, lateribus rufescentes aut ferrugineae, marginibus anguste hyalinae, 2.2–2.5 mm. longae (aristula usque ad 0.3 mm. longa inclusa). Utriculi oblique patentes, 2.3–2.6 mm. longi, circiter 1 mm. lati, membranacei, acute triquetri, leviter compressi, lateribus fere plani, 2-nerves, glabri, minute rugulosi nitidule fusco-olivacei, inferne elliptici basin versus attenuati, sursum in rostrum obliquum circiter 0.7 mm. longum marginibus scabrum ore hyalinum obliquum integrum vel bidentulum subabrupte contracti. Nux arcte inclusa, fere atra, ellipsoideo-ovoidea, tricostata, lateribus convexa, sub apicem ipsum dilatatum annulatum constricta. Stylus basi incrassatus; stigmata 3.

PAPUA: Central Division: Mt. Victoria, Owen Stanley Range, *W. MacGregor* in 1889 (TYPE in herb. Melbourne; photographs of specimen with analytical drawings in herbs. Gray, Brisbane, and Kew).

A single piece seen with one fruiting culm. In habit it appears to be close to *C. celebica* Kükenth., differing (so far as can be judged from the description) in the truncate mucronate (not acute) glumes and coarser spikes with more spreading utricles. Kükenthal describes the spike of *C. celebica* as 1½ mm. thick, but it is not clear whether this refers to the

flowering or the fruiting spike. The nut of *C. constricta* is similar to that of the *Mitratae,* but the geminate spikes and shape of the glumes do not accord with this section.

Carex tricuspidata Kükenth. in Bot. Jahrb. 70: 466. 1940.

NETHERLANDS NEW GUINEA: Mt. Wilhelmina, 4 km. northeast of top, *Brass & Myer-Drees 9970,* Sept. 1938, alt. 3650 m., tufted on grassy seepages; Mt. Wilhelmina, 11 km. northeast of top, *Brass & Myer-Drees 9803,* Sept. 1938, alt. 3400 m., covering the sandy bottom of a stream.

Previously known only from Northeast New Guinea. The specimens cited evidently belong to Kükenthal's species, though collectively they

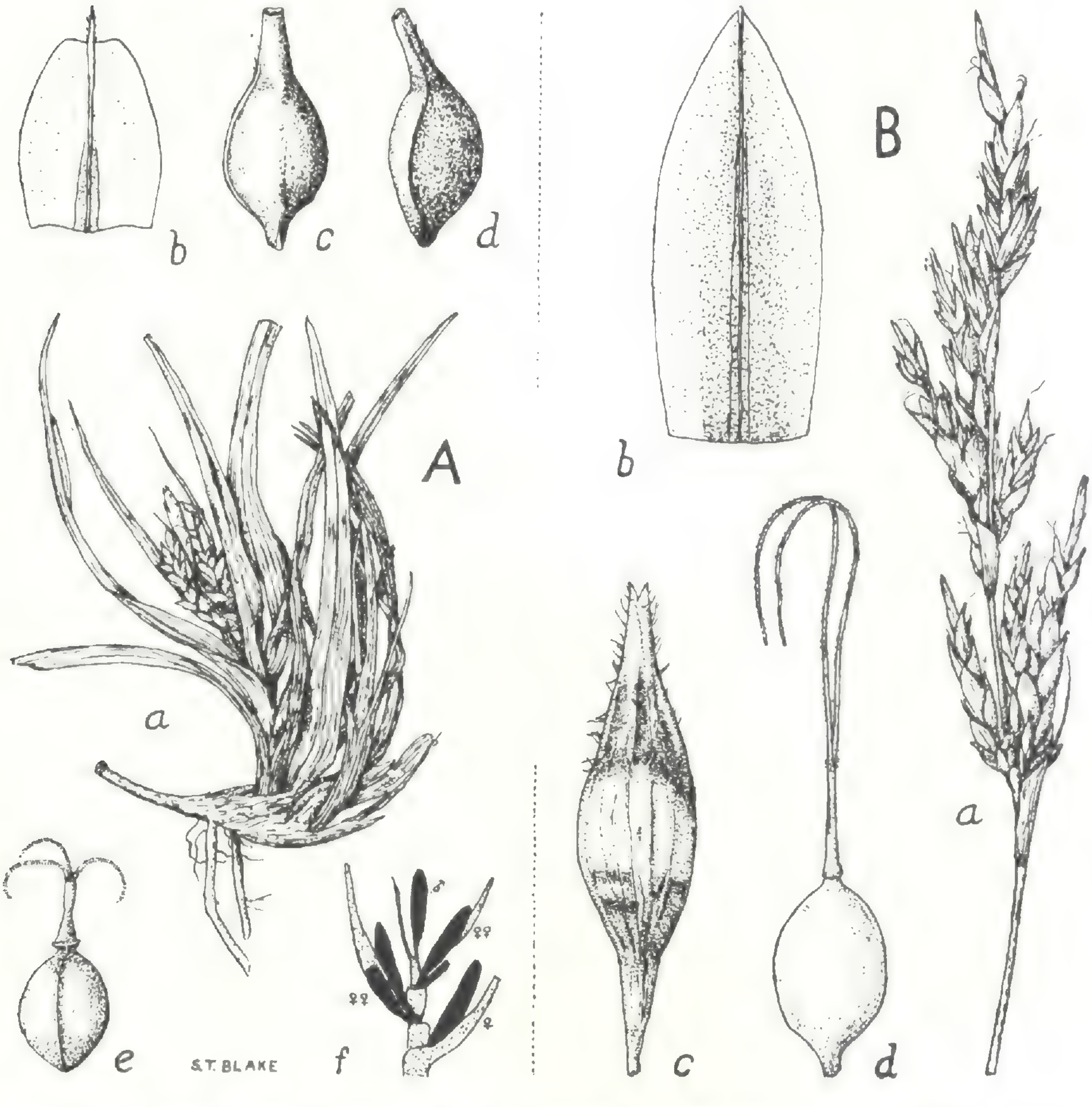

FIG. 4. A. *Carex constricta* S. T. Blake: *a.* plant, × 1; *b.* pistillate glume, flattened out, × 10; *c, d.* utricle, dorsal and lateral views, × 10; *e.* nut with style, × 10; *f.* diagram of inflorescence (spikes in solid black, bracts stippled). B. *Carex acrophila* S. T. Blake: *a.* upper part of inflorescence, × 1; *b.* pistillate glume, flattened out, × 10; *c.* utricle, dorsal view, × 10; *d.* nut with style, × 10. All figures from type-specimens.

differ from the description in that the spikes are up to 6 cm. long, sometimes all distinct from one another (not up to 4 cm. long with the two uppermost female ones fastigiate), in that the utricle is only about 3.5 mm. (3.3–3.6 mm.) and not 4 mm. long, and in that the basal leaf-sheaths ultimately break up into fibres, while an elongated rhizome appears sometimes to be present. The inflorescence of *Brass & Myer-Drees 9970* agrees pretty well with Kükenthal's description, but on this specimen the basal sheaths are broken up into fibres. In the other collection the plants are more elongated with longer and more distant spikes. The basal leaf-sheaths are but little disintegrated and evidence of an elongated rhizome is present.

Carex brunnea Thunb. Fl. Japon. 38. 1784; Kükenth. in Bot. Jahrb. 59: 60. 1924, 69: 265. 1938.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass 10924*, October 1938, alt. 2800 m., shrubby edges of a land slip, rare; Bele River, 18 km. northeast of Lake Habbema, *Brass 11592*, Nov. 1938, alt. 2200 m., occasional large clumps on grassy, formerly cultivated slopes.

New for Netherlands New Guinea, previously recorded from Northeast New Guinea. Known from the Mascarene Islands, Ceylon, E. Asia and Japan, Indo-Malaya, Queensland, N. S. Wales, and New Caledonia.

Carex acrophila sp. nov. (Sect. *Hymenochlaenae* Drejer subsect. *Graciles* Tuckerm.). FIG. 4, B.

Rhizoma brevissimum. Culmi caespitosi, erecti, cum inflorescentia 25–60 cm. alti, gracillimi (usque ad 0.9 mm. crassi), obtuse trigoni, sursum angulis admodum scaberuli, glabri, enodes, basi solum foliati. Folia prope basin culmi stipata, inflorescentiam superantia, rigida, stricta vel prope apicem flexuosa, plerumque laxe conduplicata, valde carinata, explanata usque ad 1.6 mm. lata, in apicem longe filiformem sensim attenuata, ad superficiem superam atque ad margines atque ad carinam superam debiliter laxiusculeque scabro-pilosula; vaginae fusco-brunneae vel fuscae, lucidulae, plerumque integrae, imae elaminatae. Panicula simplex, 7–15 cm. longa. Bracteae setaceae, breves, summam inflorescentiam raro attingentes, longe vaginantes, vaginis clare brunneis. Spicae 12–20, saturate brunneae, plerumque ternae vel binae (interdum singula), breviter pedunculatae, androgynae (pars mascula parte feminea brevior angustiorque), linearicylindricae, plerumque 1.5–3.5 cm. longae, 3 mm. crassae, subdensiflorae. Glumae femineae 4.5–5.5 mm. longae, elliptico-oblongae, acutae, muticae vel aristulatae, ferrugineae marginibus anguste hyalinae, dorso crebre 3-nerves anguste carinatae, lateribus striatae. Utriculi suberecti glumas superantes, saturate rufo-brunnei, 5–5.5 mm. longi, 1–1.2 mm. lati, membranacei, nervis circiter 15 notati, praecipue parte superiore marginibusque hispidi, angustius ovoidei, plano-convexi, inferne in stipitem graciliorem 1–1.4 mm. longum conspicue angustati, sursum in rostrum gracile fuscum bidentulum circiter 1.3 mm. longum subsensim contracti. Nux utriculo multo brevior, late elliptico-oblonga, plano-convexa, 1.75–2 mm. longa, 1.2 mm. lata, brunnea. Stylus tenuis, basi admodum incrassatus; stigmata 2, circiter 5 mm. longa.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9515* (TYPE), August 1938, alt. 3225 m., common about native camps; northern slopes of Mt. Wilhelmina, *Brass & Myer-Drees 10072*, Sept. 1938, alt. 4050 m., common on old grassy screes; Mt.

Wilhelmina, 7 km. northeast of top, *Brass & Myer-Drees 9829*, Sept. 1938, alt. 3560 m., alpine grassland, occasional erect tufts on wet ground; Mt. Wilhelmina, 7 km. northeast of top, *Brass & Myer-Drees 9926*, Sept. 1938, alt. 3560 m., plentiful amongst long grasses of a marshy slope, slender tufts 70–90 cm. high; Mt. Wilhelmina, 5 miles east of top, *Brass 9409*, August 1938, alt. 3440 m., common in marshy hollows.

This may be the form described by Kükenthal as *C. brunnea* Thunb. var. *subteiogyna* Kükenth., in Rep. Sp. Nov. 8: 8. 1910, from the Philippine Islands (not *C. subteinogyna* Ohwi in Mem. Coll. Sci. Kyoto Imper. Univ. ser. B, 11(5): 469, *pl. 15, text-fig. 17*. 1936), but it differs from *C. brunnea* in the nearly smooth rigid less flattened narrower leaves, the short peduncles, the longer glumes, the longer long-stipitate utricles less suddenly contracted into the beak and in the nut much shorter than the utricle. *Carex acrophila* is closely allied to *C. teinogyna* Boott, from India and Burma, but differs in the denser inflorescence, the shorter peduncles, the utricles with a longer stipe and more gradually narrowed to a shorter beak with shorter teeth, the shorter nut and rather shorter stigmas. It is also evidently close to *C. spathaceo-bracteata* Kükenth., in Bot. Jahrb. 70: 466. 1940, from Northeast New Guinea, differing in the less rough stems and leaves, 2–3-nate (not 3–5-nate) spikes, longer not conspicuously dilated sheaths to the bracts, paler glumes, and larger utricles hispid on the sides as well as on the margins.

The cited collections form a very homogeneous series, varying from one another almost exclusively in the height of the plant. The nut is occasionally subtrigonous.

Carex Brownii Tuckerm. Enum. Meth. 21. 1843.

NETHERLANDS NEW GUINEA: Balim River, *Brass 11791*, Dec. 1938, alt. 1600 m., frequent in shallow grassy pools, erect tufts 50 60 cm. high.

New for New Guinea; known elsewhere from Japan, Korea, New South Wales, and New Zealand.

Carex subtransversa C. B. Clarke in Philip. Jour. Sci. 2(C): 108. 1907.

PAPUA: Central Division: Murray Pass, Wharton Range, *Brass 4676*, June–Sept. 1933, alt. 2840 m., a few plants at edge of forest (leaves pale, inflorescence erect).

New for New Guinea; previously known from the Philippine Islands and Japan.

Carex Doniana Spreng. Syst. 3: 825. 1826.

PAPUA: Central Division: The Gap, *Carr 13731*, Dec. 1935, alt. 7200 ft., open ridge top (herb, 1 ft. tall) (herb. Canberra).

New for New Guinea. This collection was cited along with *Clemens 4451* and *Clemens 5551* under the original description of *C. japonica* Thunb. var. *mesogyna* Kükenth., in Bot. Jahrb. 69: 265. 1938, but it differs from the description in that the terminal spike is wholly male, not female in the middle. It matches one piece of *Ramos & Edaño in Philip. Bur. Sci. 40359*. There are two pieces under this number in herb. Brisbane, apparently representing the same form, the larger one agreeing with Kükenthal's description of *C. japonica* Thunb. var. *chlorostachys* Kükenth., the second piece, matched by the Carr sheet, being smaller and with narrower leaves. *Carex Doniana* appears to be sufficiently distinct from *C. japonica* Thunb.

by reason of the longer cylindrical more shortly pedunculate always erect spikes and usually broader leaves.

Carex subtransversa C. B. Clarke is very similar in appearance to *C. Doniana*, but has less spreading rather broader less distinctly nerved utricles with rather longer beaks, and the style is oblique and scarcely swollen at the base.

Carex fascicularis Soland. ex Hook. f. Fl. Nov. Zel. 1: 283. 1853.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass 9211*, August 1938, alt. 3225 m., lining open lake-shores, on hummocked marshy ground, large erect clumps 60–100 cm. high.

New for New Guinea; previously known only from eastern Australia and New Zealand.

There remain three collections of which the specimens are not sufficiently complete for satisfactory determination. *Brass 9235*, from sunny bogs, Lake Habbema, 3225 m., consists of small plants evidently allied to *C. stenophylla* Wahlenb., of the Northern Hemisphere, but the utricles are far too undeveloped for certain determination. *Brass 11540*, from the open banks of the Bele River, 2200 m., is an *Indocarex* allied to *C. filicina* Nees and *C. saturata* C. B. Clarke. It almost certainly represents an undescribed species, but as the most advanced utricles are not quite mature it seems inadvisable to attempt to describe it until more mature material is available. And finally, *Brass 4407*, from a broken cliff face on Mt. Albert Edward at 3680 m., appears to represent an undescribed species of the *Mitratae*, but only very immature flowers and one overmature utricle are present on the specimen.

QUEENSLAND HERBARIUM,
BRISBANE, QUEENSLAND, AUSTRALIA.

NOTES ON SOME PLANTS OF CUBA

Richard A. Howard

With two plates

The plants described in this paper were collected in Cuba in the summer of 1941 by the author. Headquarters during this collecting trip was the Atkins Institution of the Arnold Arboretum, at Soledad in southern Las Villas province. I am grateful to Mr. David Sturrock and the administration of the Soledad gardens for their many courtesies and for the privileges of using the facilities of the station.

Most of my collections during that summer were made in the San Juan and Trinidad Mountains and in southern Las Villas province. One short trip was made to the Oriente province with Brother Leon, of the Colegio de la Salle of Havana, and many of the new entities described in this paper were collected then. The trip to the Oriente and the territories in which collections were made were described by Brother Leon under the title, "Excursion Botanica a las Tierras de Moa" (De La Salle No. 225: 23–29. 1941). The collection numbers cited are my own. I am grateful to Brother Leon for the pleasure of accompanying him on that trip and also to Mr. George Bucher and Mr. J. R. Grist for the hospitality and assistance offered during our stay at Moa.

The description of a new species of *Neobracea* was supplied by Dr. Robert E. Woodson, Jr., of the Missouri Botanical Garden, and I am grateful to him for examining this material and supplying the name.

Rajania nipensis sp. nov. Plate I, figs. 1–8.

Planta volubilis glabra; foliis 5–7 cm. inter se remotis; petiolis 3–4 cm. longis, teretibus; laminis late triangularibus vel ovato-triquetris vel trilobis, 6 cm. longis, 5–6 cm. latis, basi rotundatis vel truncatis, lobo medio lineari-attenuato, e basi 4 cm. longo, 1 cm. lato, 3-nervio, nervis lateralibus medio parallelibus margine supra medium confluentibus; lobis lateralibus oblongis vel rotundis, cum nervis 2 (3) arcuatis; inflorescentiis 2 vel 3 axillaribus, racemosis vel spicatis, 2.5–3.5 cm. longis; floribus congestis, cymis brevibus 0.5 mm. longis, 1–3-floris; perianthii segmentis ovatis, 6; staminibus 6, usque 0.3 mm. longis, antheris ovatis, introrse dehiscentibus.

Oriente: Sierra de Nipe near Woodfred, in flower July 28–29, 1941, *Howard 6136a* (GH, type).

Rajania nipensis is similar to *R. prestoniensis* Knuth. It differs in having leaves which are rounded or truncate at the base and without a sinus. In addition, the middle lobe is 3-nerved and attenuate, not mucronate as in *R. prestoniensis*.

In the collection cited above is a single pistillate specimen tangled with

the staminate shoots selected as the type. This pistillate specimen has the mature leaves elongate-ovate, with the basal lobes rounded or poorly defined. The size and venation are approximately the same as in the type specimen. The pistillate inflorescences are fascicled in the leaf-axils, 3–5 being present per axil. The branches are racemose and 7–10 cm. long, although one or two measure 19 cm. in length. The individual flowers are solitary on pedicels nearly 2 mm. long which bear a lanceolate bract near the base. The flowers are 1–1.5 mm. high, with a 6-parted perianth. The perianth-segments are ovate and average 0.5 mm. in length. There are 6 staminodes present in the flower and these are minute and bifid at the apex. The three styles are well developed and also bifid. The ovary is strongly 6-lobed, the alternate lobes being large and small. Dissection of the small lobes reveals the locules, which are almost lost in the mass of sterile tissue. One locule is usually larger than the others and the ovules in this appear turgid. The other locules also have two superposed ovules but these are shrunken. Only a faint indication of a lateral gibbosity is developed in the specimen at hand; however, the condition of the ovules indicates that but one locule will develop and that the specimen is a true *Rajania*.

The young leaves are distinctly punctate-glandular, but the glands are fairly well masked in the mature lamina.

Rajania linearis (Griseb.) [Uline in msc. ex Knuth in syn.] Howard, comb. nov. PLATE I, FIG. 9.

Dioscorea linearis Griseb. Cat. Pl. Cub. 251. 1866.

ORIENTE: Sierra de Nipe, 15 km. south of Woodfred, *Howard 6096* ♂. Collected in flower July 28–29, 1941.

The specimens cited above are staminate, but they appear to be identical with a pistillate specimen collected by Wright (*3254*, type number of *D. linearis* Griseb.) in the Gray Herbarium.

Wright's specimen bears an annotation, "*Rajania linearis* (Griseb.) Uline det. Uline." In Knuth's monograph of the Dioscoreaceae (Pflanzenreich IV.43: 168. 1924) this Wright number is divided. One pistillate portion is cited as *Dioscorea linearis* Griseb. and another pistillate specimen is referred to *Rajania microphylla* Knuth. The species of *Rajania*, however, is typified by staminate material collected by Poeppig, and no description of the cited pistillate specimen is given. I have not seen the Poeppig specimen nor any fragments of the Wright material that could possibly be referred to the description of that staminate plant.

The specimen of *Wright 3254* at the Gray Herbarium consists of a shoot with a series of female flowers and young fruits attached. These are definitely *Rajania* fruits, having one carpel developed into a wing, with the stylar portions asymmetrically placed. On the same sheet are two infructescences bearing fruits that are *Dioscorea* fruits and which have been annotated by Uline as *D. tamoidea* Griseb. These agree with the description given by Knuth for the fruits of *D. linearis*.

The specimen selected by Knuth as the type of *D. linearis* was in the

Berlin herbarium and is presumably destroyed. It seems necessary to conclude that his description of mature fruits of *D. linearis* was based on the unattached fragments of this Wright collection, which are fruits of *D. tamoidea* Griseb., as Uline noted.

The pistillate inflorescence of *Rajania linearis* is short and bears few flowers. Mature inflorescences of the specimen on hand are 1–1.5 cm. long and bear 3–5 flowers, of which 2 or 3 mature on the average. The one-winged samaras are smaller than those of the majority of species, being about 4–5 mm. wide and 8–10 mm. long. A solitary small seed is developed.

Dioscorea nipensis sp. nov. (Sect. *Lychnostemon* Uline). PLATE II, FIG. 1.

Planta volubĭlis, 4–6 m. alta, glabra; caulibus 1 mm. crassis, striatis; foliis 8–10 cm. inter se remotis, alternis; petiolis teretibus 3 cm. longis; laminis circumscriptione angusto-ovatis, veriter elongato-triquetris, 6–7 cm. longis, 2.5–3 cm. latis, apice attenuatis, basi rotundatis, sinu nullo, auriculis rotundatis, nervis 5, arcuatis; inflorescentiis ♂ 23–27 cm. longis, spicatis, floribus in capitulis dispositis, 2–4-glomerulatis, glomerulis 0.5–1 cm. inter se remotiusculis, bracteis 0.7 mm. longis, lanceolatis, perianthio 1.5 mm. diametro, lobis ovatis; staminibus fertilibus 3, usque 0.7 mm. longis, filamentis carnosis, antheris oblongis, thecis late distinctis, extrorse dehiscentibus; antheris sterilibus 3, usque 0.4 mm. longis, quam fertilibus brevioribus, perianthii lobis interioribus oppositis, antheris apice acutis, basi hastatis; rudimento stylino 3-lobato.

ORIENTE: 15 km. southwest of Compania de Moa mill, Moa, in flower July 25, 1941, *Howard 5873* (GH, TYPE).

This species is similar to *D. tamoidea* Griseb. It may be distinguished from that species by the leaves, which have rounded bases without sinuses, and by the longer narrow blades.

Like those of most specimens of *Dioscorea,* the leaves turn black on drying. The outer pair of lateral veins frequently fork very close to the base.

Rajania tenella sp. nov. PLATE II, FIG. 2.

Planta volubilis glabra; petiolis teretibus, gracilibus, 1.5–2 cm. longis; laminis elongato-triquetris, 5.5–7 cm. longis, 3.3–4 cm. latis, apice attenuatis, basi truncatis, sinu nullo, lobis obtusis, exs. papyraceis, nervis 3, medio a lateralibus parum distincto, lateralibus arcuatis margine confluentibus; inflorescentiis solitariis vel binis axillaribus, 2.5–4 cm. longis, leviter flexuosis, cymis lateralibus 3–4 mm. longis, 4–9-floris, floribus minutis, perianthio 1 mm. diametro, lobis 0.4–0.5 mm. longis, staminibus 6, usque 0.2 mm. longis, introrse dehiscentibus; rudimento stylino subnullo.

ORIENTE: Sierra de Nipe south of Woodfred, in dense woods, with yellow flowers, July 28–29, 1941, *Howard 6134* (GH, TYPE).

Rajania tenella is similar to *R. theresensis* Uline and *R. prestoniensis* Knuth, which I know only from the descriptions. It differs from *R. prestoniensis* in the shape of the blade, the mature leaves being without sinuses and attenuate rather than mucronate. It is unlike *R. theresensis* in having the leaves 3-nerved, the inflorescence much shorter than the

leaves, and the flowers smaller. It is easily distinguished from *R. nipensis* by the truncate base of the mature leaves.

Considerable variation occurs between the juvenile leaves and the mature leaves in most species of *Rajania* (*Plate II, fig. 2*). For example, the juvenile leaves of the present species are elongate-ovate with the basal lobes more or less developed. The laminae are 2.5–3 cm. long and 0.3–1 cm. wide. There are 3 primary veins, with the lateral veins arcuate. The apex is long-attenuate and the base is truncate or rounded. The petioles are terete and from 0.6–1.2 cm. long.

Because of this variation with age, care must be taken to collect and describe only mature specimens. Frequently the basal portion of a vine may be mature, but near the apex long axillary shoots, perhaps 4–9 feet long, may appear with only juvenile leaves. It is very easy to snatch immature material when such plants grow commonly in dense thickets.

Platygyne volubilis sp. nov. PLATE II, FIGS. 3–5.

Frutex monoicus scandens; ramis molliter ferrugineo-pubescentibus; foliis alternis, petiolatis (petiolis teretibus 4–6 mm. longis ferrugineo-pubescentibus) stipulatis ovatis, pubescentibus; laminis obovatis vel oblanceolatis, 5–6.5 cm. longis, 1.5–2.5 cm. latis, rigide membranaceis, basi cuneatis, apice acutis vel rotundatis, margine sinuatis, sparse dentatis, supra et margine urenti-pilosis, subtus sparse hispidis, nervis lateralibus 5, arcuatis, anastomosantibus; inflorescentiis foliis oppositis, ♂ racemosis, ramis usque 3–4 mm. longis, 3–5-floris, pedicellis 4–5 mm. longis; sepalis 4, usque 3.5 mm. longis, triangularibus vel lanceolato-ovatis, reflexis, extus dense strigosis, intus sparse strigosis; corollis nullis; staminibus 5–8, filamentis crassis, usque 1.5 mm. longis; rudimento pistilli nullo; inflorescentiis ♀ glomeratis vel breviter racemosis, ramis ad 2 mm. longis 3–5-floris, pedicellis brevibus, 2 mm. longis; perianthiis 6–9-lobatis, lobis variabilibus, lanceolatis vel ovato-oblongis, 4–5 mm. longis, urenti-ciliatis, extus strigosis; staminium rudimentis nullis; stylis 3, usque 5 mm. longis, oblongis apice bifidis carnosis, ferrugineo-strigosis; ovario globoso trilobato, sparse urenti-piloso; fructu tricocco 5 mm. longo, apice sparse piloso, pedunculo usque 4 mm. longo; columella 3 mm. alta; seminibus rotundis, 3 mm. diametro.

ORIENTE: 20 km. west of Moa, in open pine woods, in flower and fruit, July 26, 1941, *Howard 5961* (GH, TYPE).

Most of the plants of *Platygyne* that I had seen growing in the central and western provinces of Cuba had been low shrubs, semi-scrambling over low bushes and in fence rows. It was quite a surprise, therefore, to find in the pine woods west of Moa a specimen of *Platygyne* climbing in the branches of the tall pine trees. The specimen also had distinctive obovate leaves with cuneate bases, short inflorescences, and the fruits were almost without the stinging hairs so common in the only other species of *Platygyne* recognized at present, *P. hexandra* (Jacq.) Muell. Arg.

The indument in specimens of *Platygyne* is of interest because of the several types of hairs found on different parts of the plant. Of most interest to the collector are the short white stinging hairs found only on the leaves, perianth, and on the mature fruits of *P. hexandra*. This is quite

in contrast to the other common "ortiga" of Cuba, *Tragia* spp., in which stinging hairs are abundant on the stems as well as the leaves and inflorescences. In *Platygyne volubilis* the stinging pubescence is found only on the upper surface of the leaves and along the margins as cilia. The hairs on the surface of the leaf are usually single, while the ciliate margin consists of clusters of hairs. The pistillate perianth also has a ciliate margin of stinging hairs, but this is lacking on the staminate perianth. Finally, the fruits of *P. hexandra* are usually densely covered with the white pubescence of stinging hairs. In contrast the fruits of *P. volubilis* have only a few, if any, apical stinging hairs, and the rest of the capsule is covered with a very short ferrugineous indument.

The pubescence on the rest of the plant, including the perianth, staminal disk, and styles, consists of ferrugineous short pointed stiff hairs, best described as strigose.

The pistillate perianth is extremely variable. Baillon, Euphor. 453. 1858, believed the perianth consisted of two whorls, while Mueller, in DC. Prodr. 15: 913. 1864, called them all calyx-segments of one whorl. The outer segments are usually linear-lanceolate and uniform. The inner segments vary greatly in size and shape and are frequently fused and 3–4-lobed at the apex.

The seeds are 3 mm. in diameter and almost spheroid. Mature seeds of *P. volubilis* are gray and are lightly mottled with a dark brown color. The seeds of *P. hexandra* in all the fruiting specimens I have seen are tan, mottled with dark brown. The seeds of *Platygyne* do not have an aril, although a linear protuberance or hilum is present for about one-third the circumference of the seed.

Phyllanthus chryseus sp. nov.

Frutex parvus monoicus; ramis paenultimis teretibus robustis usque 5 mm. crassis; bracteis late triangularibus, apice acuminatis, 3 mm. longis, 2.5–3 mm. latis, castaneis, nitidis; ramulis foliigeris 20–28 cm. longis teretibus, 2 mm. crassis, 16–26-phyllis; stipulis minutis usque 1 mm. longis, triangularibus vel lanceolato-subulatis; foliis distichis, petiolis 2.5–3 mm. longis, laminis orbicularibus, basi rotundatis, apice rotundatis vel emarginatis, 2.5–3.5 cm. diametro, crasse coriaceis, chryseis exsiccate viridibus, nervis lateralibus inconspicuis, marginibus revolutis; floribus ♂ axillaribus 1–2, pedicellis 3 mm. longis; sepalis 4, late ovatis vel oblongis, 3.5 mm. longis, 5 mm. latis, carnosis, staminibus coalescentibus vel 1 mm. longis, sporangiis 4, antheris late ovatis, 0.7 mm. longis, extrorse et transverse dehiscentibus; floribus ♀ solitariis axillaribus, pedicellis 1.3 cm. longis, sepalis 4, ellipticis, 5 mm. latis, 4 mm. longis, apice rotundis; disco obscuro, ovario 5 mm. longo, stylis 3, fimbriato-laceratis, 4–9 partitis; fructibus tricoccis usque 5 mm. longis; seminibus oblongis, hebeti-nigris, profunde et crasse reticulatis, 4 mm. longis.

ORIENTE: 2′ shrub, common in woods along ravine 15 km. southwest of Moa, leaves golden color, in flower and fruit July 26, 1941, *Howard 5829* (GH, TYPE); Moa, *Bucher 75* (NY); Río Cabanas, Moa, May 27–31, 1943, *Marie-Victorin & Clement 21755* (A).

This was a very striking plant in the field, for the brilliant golden leaves

were in contrast with the red iron soil on which it was growing. On drying the leaves turn light green above and pale brown beneath. This species is distinct from others in the *Orbicularia* section of *Phyllanthus* by its large orbicular leaves, which are numerous for their size. The bright golden color and strongly revolute margins of the leaves, the small stipules, and the short triangular bracts distinguish this species from others of the *P. cinctus* group as established by Carabia, in Ecological Monographs 15: 331. 1945.

In gross appearance *Phyllanthus chryseus* appears similar to *P. subcarnosus* Griseb., which is based on fragmentary material. An isotype of the latter species at the Gray Herbarium has a single fruit with unusually heavy capsules for *Phyllanthus,* and the seeds are smooth and brown. The dull black, coarsely and deeply reticulated seeds of the present species are distinct from any I have seen in this genus, but so few seeds have been described that I can not evaluate this character.

Eugenia moaensis sp. nov.

Frutex glaber; ramis hornotinis teretibus vel subcompressis, ferrugineis; petiolis 2–4 mm. longis, 1.5 mm. crassis, sulcatis; laminis lanceolato-ovatis vel ellipticis, 5.5–6.5 cm. longis, 2–2.5 cm. latis, basi et apice acutis, apice emarginatis, coriaceis, nervo medio supra leviter impresso, subtus prominente, nervis lateralibus anastomosantibus, margine revoluto; inflorescentiis axillaribus, pedicellis solitariis vel 2–3-fasciculatis, 6–10 mm. longis, bracteis minutis, 2, ciliatis; calycis lobis 4, ovatis, 2 mm. longis et latis, ciliatis; petalis 4, oblongis, 4 mm. longis, 1–1.2 mm. latis, ciliatis; staminibus numerosis 2 mm. longis; stylo 3 mm. longo; ovario 3-loculato, ovulis numerosis; baccis 5–7 mm. diametro, pericarpio crasso succulento, dense glanduloso; seminibus 1 vel 2, rotundatis vel subreniformibus 3–5 mm. longis, testa brunnea membranacea nitida.

ORIENTE: 7′ shrub, flowers yellow, fruits green, along creek bank at Moa, *Howard 5866* (GH, TYPE).

The leaves of the present species are thick and coriaceous. The upper surface is shiny when dry and darker in color than the lower surface. Punctate glands are present in the lamina but are well hidden in the tissues of the leaf. Approximately 6 strong lateral veins are revealed on the upper leaf-surface, and these anastomose near the margin. The veins are obscure below.

Eugenia moaensis appears to be similar to *E. (?) Ossaeana* Urb., which was described on very incomplete material collected by Shafer in the same locality as the present specimen. It is different in being completely glabrous, except for a ciliate perianth, and the venation of the leaves does not agree with the description as given by Urban. The pedicels of the present species are much longer than those of *E. (?) cupuligera* Urb., to which this plant is also similar. *Eugenia moaensis* may also be related to *E. cristalensis* Urb.; however, it differs from this in the leaf-characters and the leaf-size.

Calyptranthes oblongifolia sp. nov.

Frutex; ramis hornotinis compressis, sub interstitiis foliorum plus

minusve sulcatis, pilis dibrachiatis adpressis ferrugineis vel pallescentibus vestitis, annotinis glabrescentibus teretibus vel lineato-striatis, dichotomis; petiolis 4–5 mm. longis subteretibus supra sulcatis; laminis oblongis vel oblongo-lanceolatis, 4.5–7 cm. longis, 1.5–2 cm. latis, basi rotundatis, antice acutis vel rotundatis, nervo medio supra per totam longitudinem anguste impresso, nervis lateralibus ca. 15 inconspicuis; inflorescentiis ad basin ramorum hornotinorum binis, subcapitatis; pedunculis 2–4, 2–5 mm. longis, capitulis 3–5-floris; baccis nigro-purpurascentibus, depresse sphaeroideis, 5–7 mm. diametro, loculis 2; seminibus reniformibus 2 in quoque loculo, 3 mm. longis.

ORIENTE: Along south coast of Bahia de Moa near Moa, 4′ shrub, fruits green becoming purple on maturity, *Howard 5948* (GH, TYPE).

Calyptranthes oblongifolia is characterized by the oblong or lanceolate-oblong leaves and the few-flowered, very short peduncles of the seemingly capitate, axillary inflorescence. In general appearance this species is similar to *C. rupicola* Urb. and *C. heterochroa* Urb.

The occurrence of malpighiaceous or two-armed hairs on the plant is characteristic of several species of *Calyptranthes*. In the present species these hairs are very dense on the young leaves, the stems, peduncles, flowers and fruits, giving the appearance of a ferrugineous tomentum. In the older leaves the hairs are broken off even with the epidermis and leave the sunken hair-bases commonly found in the other species and which frequently seem to be mistaken for epidermal glands. The upper surface of the mature leaves of *C. oblongifolia* is glabrous except for the impressed midrib, while the hairs on the lower surface persist. These hairs usually remain ferrugineous in color, although many turn gray or white.

The inflorescence consists of short axillary peduncles with a very few flowers and appears to be capitate. The bracts subtending the flowers are minute and fall away very early, none appearing in the mature infructescences. The flowers had matured on the specimens studied, but several young fruits still possessed 3 or 4 stamens attached to the hypanthium at the line of dehiscence of the calyptra. The style was 2 mm. long and bifid at the apex. The calyptra was conical and about 1.2 mm. in diameter.

The drupes are a dark purple color when fresh, drying black or brown. Because of the dense pubescence, many appear to be silvery in reflected light. There are 2 cells to the ovary, each containing 2 seeds. The seeds are reniform and tan on the convex surface and black or dark brown on the sides and in the concave surface. The embryo is curved.

Psidium confertum sp. nov.

Frutex vel arbor parva; ramis hornotinis plus minusve compressis tenuibus vix 1.5 mm. latis, tomentosis, pilis crispis, vetustioribus ferrugineis; petiolis 2–2.5 mm. longis, laminis ovatis vel ellipticis, 2–2.8 cm. longis, 1.4–1.6 cm. latis, basi rotundatis, apice rotundis vel parce emarginatis, margine recurvo, nervo medio supra impresso, subtus prominente, nervis lateralibus obsoletis; cymis axillaribus dense tomentosis, 3–5-floris, rhachi 4–6 mm. longa, pedunculis 0.8–1.1 cm. longis; calycibus 4-lobatis, leviter imbricatis, tomentosis, lobis ovatis 1–2 mm. longis; petalis 4 vel 5, ovatis,

extus sparse pubescentibus, dense glandulosis; staminibus numerosis; stylis 2 mm. longis; ovario 2-loculari, ovulis in quoque loculo ca. 10; seminibus reniformibus 2 mm. longis; fructibus immaturis, stylis usque 9 mm. longis.

ORIENTE: Wet hillside near the airfield at Moa, 12′ shrub collected in flower and young fruit July 26, 1941, *Howard 5901* (GH, TYPE).

Psidium confertum is characterized by the small ovate to elliptic leaves, the persistent ferrugineous tomentum, the cymose inflorescence, and the 2-celled ovary. In these characters it differs from *P. bullatum* Brit., *P. ophiticola* Brit. & Wils., and *P. leiophloeum* Urb., to which it is related.

The species is named for the crowded condition of the flowering shoots. The internodes are from 1–1.5 cm. long with the leaves opposite or in whorls of three at the nodes. The compact inflorescence adds to the density of the shoots.

The leaves are densely glandular; however, the glands are hidden by the persistent tomentum on the lower surface and are not visible from the dorsal surface. The very young leaves are densely pubescent on both surfaces. The lower surface remains persistently pubescent, while the upper surface is glabrous and becomes a bright yellow-green color on maturity.

Two small bracts subtend the flower. The buds are globose above the ovary. Mature fruits are 5–6 mm. in diameter, and the numerous seeds are reniform, about 2 mm. long. On the concave surface of each seed extending over the sides are areas which are dark brown to black in color. The remaining surface of the seed is a yellow-brown. The embryo is only slightly curved.

Eugenia Sturrockii sp. nov.

Arbor parva vel frutex, glaber; ramis hornotinis compressis, sub interstitiis foliorum plus minusve sulcatis; petiolis 3–4 mm. longis, subteretibus supra sulcatis; laminis anguste lanceolatis 4.5–5 cm. longis, 0.8–1 cm. latis, basi et apice acuminatis, coriaceis glabris, supra nitidis, marginibus revolutis, nervis lateralibus inconspicuis; inflorescentiis axillaribus, racemosis, racemis usque 2 mm. longis, bracteis ovato-lanceolatis, minutis; 4–5-floris, pedunculis 5–7 mm. longis; sepalis 4, ovatis, usque 1 mm. longis, glabris; petalis non visis; staminibus numerosis, subaequalibus; stylo 2 mm. longo; baccis 4 mm. diametro, loculis 2, seminibus reniformibus vel ovalibus, 1 in quoque loculo, 2.5 mm. longis, testa membranacea, levi, brunnea, nitida.

ORIENTE: 8′ shrub or small tree in dense woods of ravine, 15 km. southwest of Compania de Moa mill, Moa, collected July 26, 1941, *Howard 6034* (GH, TYPE).

This species is named in honor of Mr. David Sturrock, who was Superintendent of the Atkins Institution of the Arnold Arboretum at Soledad, Cuba, for many years and who was so very helpful in arranging my trip to the Oriente.

This species at first glance is similar in appearance to *E. psiloclada* Urb. However, the leaves of the new species are coriaceous, the veins obscure, the upper surface shiny, and the margin strongly recurved. *Eugenia psiloclada*, by contrast, has thin leaves with veins and glands prominent,

dull surfaces, and perfectly flat margins. The leaves of *E. Sturrockii* have the characteristic glands, but these are buried in the leaf-tissue and are visible only when the leaf is held to the light.

Several of the fruits examined had only one mature seed. Closer examination revealed an aborted cell and ovule at the apex of the fruit. The flowers are articulated to the pedicel, the fruits dehisce at this point very readily, and the peduncles persist even on the old shoots.

Neobracea Howardii Woodson, sp. nov.

Frutex ramosus ca. 2 m. altus, ramis teretibus cortice luteo, ramulis puberulis tandem glabratis. Folia opposita petiolata, lamina late elliptica apice obtusa basi latiuscule acuta 4–7 cm. longa 2–3.5 cm. lata firmiter membranacea supra nitidula subtus dense puberula, petiolo 0.4–0.8 cm. longo puberulo. Inflorescentia racemosa subcorymbiformis terminalis vel subterminalis pluriflora, pedunculo tenui ca. 3–4 cm. longo puberulo, pedicellis ca. 0.5 cm. longis puberulis, bracteis lineari-oblanceolatis usque 0.5 cm. longis subfoliaceis. Flores albi, calycis laciniis anguste lanceolatis acuminatis 0.5 cm. longis subfoliaceis ut in pedicello vestitis intus in sinibus 0–2-glandulosis, corollae subinfundibuliformis tubo ca. 0.9 cm. longo basi ca. 0.1 cm. diam. faucibus usque 0.25 cm. diam. ampliatis extus sparse irregulariterque pilosulo intus prope basim staminigero, lobis late oblongo-dolabriformibus ca. 0.8 cm. longis. Antherae subsessiles lineari-lanceolatae basi anguste sagittatae ca. 0.3 cm. longae dorso dense puberulae. Ovaria oblongoidea glabra ca. 0.15 cm. longa, nectaria 5 compresse subquadrata ca. 0.05 cm. longa, stylo crassiusculo ca. 0.2 cm. longo, stigmate capitato 5-maniculato ca. 0.05 cm. longo apice papillato. Folliculi immaturi tenues remote moniliformes.

Las Villas: Limestone Loma Ventana, Trinidad Mountains, San Blas–Buenos Aires, Aug., 1941, *Howard 6495* (Herb. Missouri Bot. Gard., type).

This species is very well marked by its abundant pubescence and broad, elliptic foliage, as well as the several-flowered inflorescence.

Since the publication of my revision of *Neobracea* (in Ann. Missouri Bot. Gard. **23**: 169. 1936), I have examined a flowering specimen of *N. Ekmanii* Urb., the type and heretofore the only known specimen of which was in fruit, and that apparently mislaid when I visited the herbarium at Dahlem in 1930. The flowering specimen was collected by Mrs. G. C. Bucher during the summer of 1939 near Moa, Oriente, Cuba. The corolla, apparently pink, is very broadly infundibuliform, the proper tube 6 mm. long, 1 mm. in diameter at the orifice, the lobes 10 mm. long. The calyx-lobes are linear-lanceolate, 2 mm. long.

Bonnetia cubensis (Brit.) comb. nov.

Kieseria cubensis Brit. in Bull. Torr. Bot. Club 41: 19. 1914.

Bonnetia Mart. & Zucc. has been conserved (Kew Bull. 1940: 113. 1940) and *Kieseria* Nees has been rejected. A new combination is needed for this Cuban species.

The species is apparently endemic along the coast of Bahia de Moa on serpentine soil. The type collection was made in 1914 and only two more recent collections are known, *Howard 5842*, a 15′ tree with pink flowers

collected July 26, 1941, in dense woods 15 km. southwest of Compania de Moa mill, and *Marie-Victorin, Clement & Alain 21436*, collected in flower April 1943 at the mouth of the Punta Gorda River at Moa.

Buxus flaviramea (Brit.) comb. nov.
Tricera flaviramea Brit. in Bull. Torr. Bot. Club 42: 499. 1915.

A second record of this species is *Howard 5100*, collected June 15, 1941, in open grassy savannah 10 km. west of Santa Clara city, Las Villas Prov.

Xyris Jupicai Rich. in Act. Soc. Hist. Nat. Paris 1: 106. 1792.

This is a very widely distributed species through the Antilles, but the present collection (*Howard 6011*, in flower, July 26, 1941, airfield at Moa, Oriente) is of interest since it is the first representative of the genus known to me from the Oriente. The many species of *Xyris* in Cuba are centered in Pinar del Rio province, with two species reaching the Cienaga swamps in southwestern Las Villas province. The present collection consists of larger and more tuberculate plants than the average, but the specimens still fit within the limits of the species as defined by Malme in N. Am. Fl. 19: 11. 1937.

Cassia clarensis (Brit.) comb. nov.
Chamaecrista clarensis Brit. in N. Am. Fl. 23: 278. 1930.

Cassia insularis (Brit. & Rose) comb. nov.
Chamaefistula insularis Brit. & Rose. in N. Am. Fl. 23: 239. 1930.

In addition to those from the type localities, specimens of these two species are known from the Castillo de Jagua and the coast of Cienfuegos Bay.

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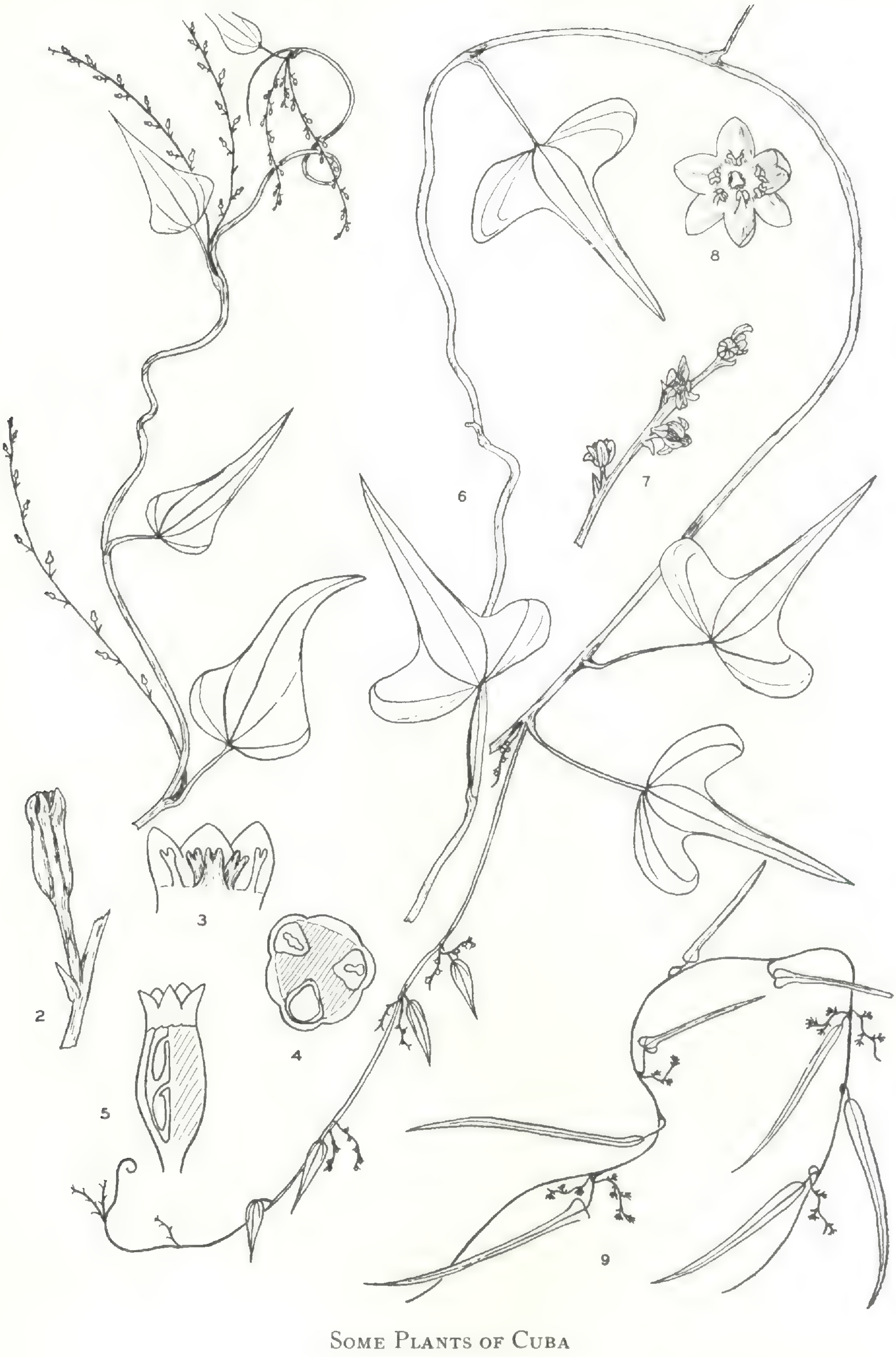
EXPLANATION OF PLATES

PLATE I

FIGS. 1–8. *Rajania nipensis* Howard (*Howard 6136a*): 1. habit, ♀ × ½; 2. single flower from portion of ♀ inflorescence, × 6; 3. portion of ♀ flower showing the 3 bifid styles and 2 of the bifid staminodes, × 15; 4. cross-section of the ovary showing the six lobes and the 3 locules, one of which has fertile ovules, × 15; 5. sagittal section of flower showing two superposed fertile ovules, × 8; 6. habit, ♂ × ½; 7. portion of ♂ inflorescence, × 3; 8. ♂ flower showing pistil-rudiment and 6 introrse fertile stamens, × 15. FIG. 9. *Rajania linearis* (Griseb.) Howard (*Howard 6096*): habit, × ½.

PLATE II

FIG. 1. *Dioscorea nipensis* Howard (*Howard 5873*): habit, × ½. FIG. 2. *Rajania tenella* Howard (*Howard 6134*): habit, × ½. FIGS. 3–5. *Platygyne volubilis* Howard (*Howard 5961*): 3. habit, × ½; 4. dorsal view of fruit, × 1.5; 5. lateral view of fruit, × 1.5.



SOME PLANTS OF CUBA

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RELATIONSHIP AND TAXONOMY OF THE GENUS BRANDISIA

Hui-Lin Li

The genus *Brandisia* is confined to the warmer parts of continental eastern Asia from eastern India, Burma, and Indo-China to southwestern and southern China. It has been included in the Scrophulariaceae, usually in the tribe Cheloneae, together with other anomalous genera like *Paulownia* and *Wightia*. Its taxonomic position has been doubted ever since it was first described, but no extensive and intensive studies have ever been made on the genus.

The following study, based on the Chinese species of the genus, is made on materials assembled from various herbaria in America. To the curators of these herbaria I am indebted for their kindness in furnishing material for the study. This study was made at the Academy of Natural Sciences of Philadelphia during the tenure of a Harrison Fellowship for Research of the University of Pennsylvania. To Mr. Charles M. B. Cadwalader, President of the Academy, I wish to express my thanks for permitting me access to the splendid library and herbarium facilities. To Dr. Francis W. Pennell, Curator of Plants, my thanks are due for his suggestions and his kindness in reading the manuscript.

Abbreviations for the various herbaria cited are as follows:

AA	Arnold Arboretum of Harvard University
ANSP	Academy of Natural Sciences of Philadelphia
B	Bonati Herbarium, to be deposited at the herbarium of the University of California at Los Angeles
MBG	Missouri Botanical Garden
NYBG	New York Botanical Garden
RBGE	Royal Botanic Gardens, Edinburgh
UC	University of California
USNH	United States National Herbarium

RELATIONSHIP

The tribe Cheloneae of the Scrophulariaceae is very artificial and heterogenous. To this tribe have been referred several of the woody genera of various localities, while the family Scrophulariaceae as a whole is herbaceous. The anomalous positions of *Paulownia* and *Wightia* have been questioned by some authors. Hallier (in Bull. Herb. Boiss. II. 3: 181–207. 1903), in making a review of the taxonomic relationships of the various genera of the Scrophulariaceae, concluded that these two genera should be assigned to the Bignoniaceae. Campbell (in Bull. Torrey Bot. Club 57: 47–50. 1930) reached the same conclusion for *Paulownia*. He

indicated that the small amount of endosperm present in the seed is not sufficient reason to exclude it from the Bignoniaceae, with which it agrees in many other characters. Hallier, however, still considered *Brandisia* as belonging to the Cheloneae and evidently had not made any special study of the genus.

When Hooker and Thomson first described the genus no fruiting material was available. They noted the general appearance of the plant to be very different from the Scrophulariaceae, and rather verbenaceous. However, they placed it in the Scrophulariaceae because of the many-ovuled capsule. They remarked: "The order can, in fact, only be approximately determined, as the dehiscence of the fruit and the structure of the seed are unknown. If the seeds be exalbuminous, it will go to Bignoniaceae; but the ovary and placentation are so much like Scrophulariaceae, that in all probability albumen will be found in the seeds."

With regard to its position in the Scrophulariaceae, they said: "The position of *Brandisia* among Scrophularineae, as Mr. Bentham has kindly pointed out, is probably among Cheloneae, the only tribe in which large woody climbing plants occur. The flowers though solitary, have two opposite bracteoles on the pedicel, and the curiously elongate ovules probably become winged seeds like those of *Wightia*." In the Genera Plantarum, the fruits and seeds were described and the genus was placed in the tribe Cheloneae together with *Wightia* and *Paulownia*. This has been followed subsequently by other authors.

In 1873, Kurz (in Jour. As. Soc. Beng. 42(2): 39–141. 1874), in listing *Brandisia discolor* for the Burmese flora, considered the status of the genus and made the following statement: "Wightia, Wall., arcte affinis. Etiam *Buddleiae* generi affinis, sed differt corolla irregulari, etc. et certissime inter Sesameas recipienda est. Gardneria, a cl. Benthamio Loganiaceis adnumerata, Solanea esse videtur." He placed the genus under "Pedalineae." In 1877 Kurz (For. Fl. Brit. Burma) listed *Gelsemium* and *Buddleia* under "Pedalineae," in addition to *Brandisia*. Both these genera belong to the Loganiaceae.

Hance (in Jour. Bot. 18: 299. 1880) mentioned that *Brandisia* "has a curious resemblance to the genus Eremophila, in Myoporaceae." This is an Australian genus. The Myoporaceae is a small family, with the genus *Myoporum* extending from the tropics of the Old World to India and eastern Asia.

Thus we have suggested relationship for the genus *Brandisia* to the following families: Loganiaceae, Solanaceae, Scrophulariaceae, Bignoniaceae, Pedaliaceae, Myoporaceae, and Verbenaceae.

Being strongly zygomorphic in its corolla, *Brandisia* cannot be associated with either Loganiaceae or Solanaceae, in which the corolla is actinomorphic. The place of the genus is evidently with the other families which have distinct zygomorphy. In spite of the general resemblance of the plant in appearance to some genera of the Myoporaceae and the Verbenaceae, its many-ovuled ovaries and capsular fruits will not permit it to be included

in either of these two. Being a shrubby genus and without staminodes, it is not referable to the Pedaliaceae.

The families Scrophulariaceae, Bignoniaceae, Gesneriaceae, and Orobanchaceae are closely related and it is sometimes difficult to draw sharp distinctions between them. The Gesneriaceae and Orobanchaceae are predominantly herbaceous families, with unilocular ovaries, the latter being also parasitic. The choice for placing *Brandisia* is therefore left to the Scrophulariaceae and the Bignoniaceae.

The Bignoniaceae are nearly all woody plants, many of them climbers. The Scrophulariaceae are predominantly herbaceous. The chief distinction between the two families is the presence of endosperm in the seeds in the Scrophulariaceae and the absence of the same in the Bignoniaceae. The fruit of the Scrophulariaceae is usually a capsule or sometimes a berry. The seeds are usually numerous and small. In the Bignoniaceae, the fruit is most often a two-valved capsule, usually very long and silique-like. The seeds are numerous, large, flattened, and membranaceous-winged.

In the Scrophulariaceae, the tribe Cheloneae is one of the few that contains woody genera. In this tribe, which is artificial and ill-defined, there have been included some anomalous genera including *Paulownia*, *Wightia*, and *Brandisia*. *Paulownia* has been included in this family instead of the Bignoniaceae because of the presence of endosperm in the seeds. Hallier (l. c.) has shown that endosperm is only scantily present in *Paulownia* and is absent in *Wightia*, and that the seeds of both are winged. He concluded that both genera, in which all species are trees, should be transferred to the Bignoniaceae.

The ovoid loculicidal capsular fruit of *Brandisia* is very similar to those of the Scrophulariaceae, but the seeds, although very small, are winged and are without endosperm. They are small, numerous, linear, with an elongated membranaceous winged testa which is reticulated. The fruit of *Wightia* is an oblong or ovoid capsule, but is septicidal, and the seeds are membranaceous and broadly winged all around. The fruit of *Paulownia* is a woody capsule, loculicidally dehiscent, with numerous small winged seeds.

There is an apparent relationship between the three genera mentioned. The transference of *Paulownia* and *Wightia* to the Bignoniaceae, although they still appear somewhat anomalous in that family, seems to be a better arrangement than to have retained them in the Scrophulariaceae. *Brandisia*, although seeming even more isolated if placed in the Bignoniaceae, certainly should be associated with *Wightia*, whatever the latter's disposition. Here we have a situation in which there must be additional knowledge in anatomy, pollen structure, cytology, etc., before a satisfactory disposition can be made of these genera as to their taxonomic position, as well as delimitation of the various families concerned.

DISTRIBUTION

To the eight species recognized in this study, there should be added

three more from Annam, described by Bonati, of which no material is available. The genus ranges from Assam (India) and southern Burma to western China, north to western Hupeh, and southern China, east to Kwangtung. It is also found in Annam, Indo-China. So far it has not been recorded from Formosa, Hainan, or Tonkin.

The species are found mostly on mountains up to an altitude of 3000 meters, those in the south ascending usually to higher levels than those in the north. Most of the species are local in distribution and rare in occurrence. The most common and most widely distributed species is *Brandisia Hancei,* which is found in Yunnan, Szechuan, Hupeh, Kweichow, and Kwangsi. *Brandisia rosea* is found in northwestern Yunnan, Assam, and Bhutan. *Brandisia discolor* is found in southern Burma and southern Yunnan. *Brandisia Swinglei* occurs in Kwangtung and eastern Kwangsi, while *B. kwangsiensis* is known only from Kwangsi; the two species *B. laetevirens* and *B. glabrescens* are confined to southern Yunnan. *Brandisia racemosa* is found in Yunnan from the south to the northeast. Three species, *B. Chevalieri, B. annamitica,* and *B. scandens,* are known from Annam only.

The genus is primarily of the subtropical regions of eastern continental Asia, particularly of the mountains at medium levels. The center of distribution is apparently in Yunnan, where six of the eleven species occur. Only two, *B. Hancei* and *B. rosea,* occur in the Sino-Himalayan region in northwestern Yunnan, and these are not endemic. More species, although mostly of rather limited distribution, are found in the warmer regions of the province in the south as well as in the east.

TAXONOMY

Brandisia Hooker f. & Thomson in Jour. Linn. Soc. Bot. 8: 11. 1865.

Shrubs, erect, scandent, or straggling, sometimes parasitic, often with stellate tomentum; leaves opposite or rarely subopposite, oblong-lanceolate to ovate, entire to slightly serrate, usually densely tomentose especially below, short-petiolate; flowers axillary, solitary or rarely in pairs, sometimes several together or short- or long-racemose, pedicellate, the pedicels bibracteolate; calyx campanulate, with or without distinct veins, subequally 5-dentate or sometimes 4–7-dentate, rarely bilobed; corolla infundibular, bilabiate, usually densely tomentose, the tube usually incurved, the lips spreading, the upper lip larger and longer, concave, 2-lobed, the lobes broad, obtuse, the lower lip shorter, 3-lobed, the lobes smaller, subequal or unequal, acute, attached at the same level or in the middle and much lower; stamens 4, didynamous, ascending, subexserted or included, attached near the base of the corolla-tube; staminodes absent; filaments glabrous; anthers rounded, bilocular, the cells confluent above, long-pilose especially at the tip and the margins; ovary ovoid, hairy, bilocular, many-ovuled; styles elongate, filiform, glabrous, the stigma simple, entire; ovules numerous, linear-oblong; fruits capsular, chartaceous, ovoid, acute, loculicidally dehiscent into 2 valves; seeds small, numerous, linear, with thin winged membranaceous elongated testa, reticulated.

TYPE SPECIES: *B. discolor* Hook. f. & Thoms.

About 11 species, in the subtropical and warmer parts of continental eastern Asia.

With the addition of many other species to the original, it is necessary to redefine the generic concept of the genus and to form three subgenera, of which the last two contain each but a single species. In addition to the eight species recognized for China, India, and Burma, there are three species described by Bonati from Annam, of which no material is available to me. Two of these, *B. Chevalieri* Bonati and *B. scandens* Bonati, evidently belong to *Eubrandisia*. *Brandisia annamitica* Bonati, described as having the flowers in groups of 3–5 and having two staminodes, may require the erection of another subgeneric group.

Subgenera of Brandisia

Subgenus I. **Eubrandisia**, subgen. nov.

Frutex erectus vel scandens; foliis oppositis, basi acutis vel cordatis; floribus axillaribus, solitariis vel binis; corolla flava vel rosea, labio antico breviore, lobis subaequalibus; calyce campanulato, plerumque 5-dentato.

Subgenus II. **Rhodobrandisia**, subgen. nov.

Frutex erectus; foliis oppositis vel suboppositis, basi longe attenuatis; floribus axillaribus, solitariis vel binis; corolla rosea vel raro flava, labio antico fere breviore, lobis subaequalibus; calyce bilobato, lobis integris vel leviter bifidis.

Subgenus III. **Coccineabotrys**, subgen. nov.

Frutex scandens, parasiticus; foliis oppositis, basi rotundatis; floribus racemosis; corolla rubra, labio antico valde breviore, lobis inaequalibus; calyce campanulato, 5-dentato.

Key to the Chinese species

A. Flowers axillary, single, rarely 2 together, scattered throughout the whole length of the stems; calyx usually long-pilose within, sometimes tomentose; lower lip of corolla about as long as or slightly shorter than the upper lip, the lobes subequal and attached at about the same level; capsules densely tomentose to rarely glabrescent.
  B. Calyx more or less prominently 5-costate, 5-dentate, usually long-pilose within; leaves strictly opposite, the base acute to cordate (Subgenus I. *Eubrandisia*).
    C. Calyx broadly campanulate, about as long as broad, much enlarged above, the teeth divided for ⅓ to ½ the length.
      D. Leaves subsessile to short-petiolate, the petiole to 4 or 5 mm. long; leaf-bases strongly cordate.....1. *B. Hancei.*
    DD. Leaves distinctly and slenderly petiolate, the petioles 5 mm. or more long; leaf-bases acute to rounded or subcordate.
      E. Petioles short, about 5 mm. long; calyx large, 10 mm. long, 8–9 mm. wide.
        F. Leaves strongly discolored on the two surfaces, the upper dark brown to almost black in the dried state; leaf-bases rounded to subcordate.
          G. Leaves broadly ovate, to 4 cm. wide and 9 cm. long; indumentum grayish; calyx-teeth long-acute, 7 mm. long. .....2. *B. Swinglei.*
        GG. Leaves narrowly ovate, to 3 cm. wide and 9 cm. long; indumentum brownish; calyx-teeth short-acute, to 4 mm. long.....3. *B. laetevirens.*

FF. Leaves subconcolorous on the two surfaces, the upper brownish in the dried state; leaf-bases acute to subrounded..4. *B. kwangsiensis.*

EE. Petioles long, 1 cm. or more in length; calyx small, 6–7 mm. long and wide.....5. *B. discolor.*

CC. Calyx cylindric-campanulate, 1½ to 2 times as long as wide, narrowed or very slightly expanded above, the teeth divided to about a quarter of the length of the calyx.....6. *B. glabrescens.*

BB. Calyx without prominent nerves, 2-lobed, tomentose to glabrous within, the lobes entire or slightly bifid; leaves opposite to subopposite, the bases long-attenuate (SUBGENUS II. *Rhodolobrandisia*).....7. *B. rosea.*

AA. Flowers racemose, many together on long or short branches or toward the end of the stems; calyx pubescent within; lower lip of corolla twice or more shorter than the upper lip, the middle lobe smaller than and attached half as low as the lateral ones in a deep notch; capsules glabrous (SUBGENUS III. *Coccineabotrys*). .....8. *B. racemosa.*

1. **Brandisia Hancei** Hook. f., Fl. Brit. Ind. 4: 257. 1884, *in nota;* Forbes & Hemsl. in Jour. Linn. Soc. Bot. 26: 179. 1890; Diels in Bot. Jahrb. 29: 565. 1900; Rehder in Sargent, Pl. Wils. 1: 573. 1913; Limpricht in Rep. Sp. Nov. Beih. 12: 480. 1922; Hu in Jour. Arnold Arb. 5: 233. 1924; Pai in Contr. Inst. Bot. Nat. Acad. Peiping 2: 186. 1934; Hand.–Maz., Symb. Sin. 7: 831. 1936.

Brandisia discolor sensu Hance in Jour. Bot. 18: 299. 1880, *non* Hook. f. & Thoms.

HUPEH: No precise localities, *Henry 1009* (NYBG), *3007* (USNH); western Hupeh, *Wilson 147* (NYBG, USNH), *147a* (NYBG); Ichang, *Wilson 2404* (AA, USNH); Liang Sung Kou, *W. Y. Chun 3840* (AA), *4185* (USNH); En-shih District, *H. C. Choze 1885* (AA, USNH); Yangtze Gorges, *N. C. Nelson s. n.* (UC). SZECHUAN: Tchen-keou-tin, *Farges s. n.* (ANSP, B); Mount Omei, *Chiao & Fan 362* (AA), *T. T. Yu 289* (AA); Nan-chuan District, *W. P. Fang 5675* (AA, ANSP, NYBG), *5676* (AA, ANSP, NYBG); Kwang-yun District, *F. T. Wang 22616* (AA); Wanhsien, Yen-ching-kou, *Mrs. W. Granger 3* (UC). YUNNAN: No precise localities, *E. E. Maire 1344* (UC), *Forrest 9370* (AA), *9672* (AA), *T. T. Yü 14812* (AA); Hee-chan-men, *Delavay 1934* (ANSP, B, NYBG); Mo-so-yn, *Delavay 4626* (ANSP, B); Kiao-kia, *F. Ducloux 1237* (UC); Yunnan sen, *F. Ducloux 159* (ANSP), *1027* (NYBG, UC); Siao-ou-long, *E. E. Maire 183* (AA); Pe-yen-tsin, *S. Ten 23* (AA), *34* (AA); Yungpe, *S. Ten 403* (UC); Mengtze, *A. Henry 9013* (AA, ANSP, MBG, NYBG, USNH); between Muang Hing and Szemao, *J. F. Rock 2821* (AA, UC, USNH); between Tengyueh and Likiang, *J. F. Rock 8115* (AA, UC, USNH); Kun-ming, *C. Schneider 55* (AA), *227* (AA), *H. Handel Mazzetti 13053* (AA), *C. W. Wang 62624* (AA), *62050* (AA), *F. C. How 74241* (AA), *74247* (AA); Tsang-shan, near Tali, *C. Schneider 3246* (AA); Kien-shuei District, *H. T. Tsai 53027* (AA); Likiang, *C. W. Wang 71414* (AA), *K. M. Feng 2547* (AA), *2635* (AA), *R. C. Ching 20073* (AA), *21687* (AA); Hua-ning, *Y. Tsiang & H. Wang 16377* (AA); Monhua, *T. T. Yu 18269* (AA). KWEICHOW: Kiang-kou District, *Steward, Chiao, & Cheo 948* (AA, NYBG, USNH); Ying-kiang District, *Steward, Chiao, & Cheo 895* (USNH), *Y. Tsiang 7795* (NYBG); Chengfeng, *Y. Tsiang 4456* (AA, NYBG, USNH); Tungtze, *Y. Tsiang 4944* (NYBG), *5134* (NYBG, UC); An-lung, *Y. Tsiang 7416* (NYBG, UC), *9321* (NYBG); Chen-lin-shan, Kweiyang, *S. W. Teng 90019* (AA). KWANGSI: Ling-yun District, *Steward & Cheo 49* (AA).

This species was first identified as *Brandisia discolor* Hook f. & Thoms. by Hance. Hooker (l. c.), however, under that Burmese species simply mentioned: "The Chinese plant referred to *B. discolor* by Hance, differs in the broad calyx-lobes and corolla; it is *B. Hancei*, H. f." Hance's type is a Mesney collection from Kweiyang, Kweichow Province. Forbes and Hemsley cited *Henry s. n.* from Hupeh, *Mesney s. n.* from Kweichow, and also *Maire s. n.* and *Bourne s. n.* of unclarified locations. Rehder cited *Henry 1150* and *3007* from western Hupeh, and *Henry 9013* from Mengtze,

Yunnan. He said: "No good description of this species has been published so far, but according to Dr. A. B. Rendle of the British Museum who kindly compared Wilson's No. 3404 with the type of *B. Hancei* Hook. f. from Kweichou, there is no difference between the two specimens. Wilson's specimen also agrees perfectly with Henry's specimen from Hupeh referred by Hemsley to *B. Hancei*. Henry's No. 9013 from Yunnan differs slightly in its smaller and narrower leaves." Hu gave a detailed description for the species but cited no specimens.

Brandisia Hancei is apparently a common shrub at medium levels (500–2600 meters) in the mountains of western China. It is readily distinguished from related species by its smaller, very compactly arranged leaves, which are nearly sessile and strongly cordate at base. The leaves are densely stellate-ferruginous-tomentose on the lower surfaces and are not strongly discolored on the two surfaces as in some other species. The flowers (March–November) are red or yellow on the inside.

2. **Brandisia Swinglei** Merrill in Philip. Jour. Sci. Bot. 13: 157. 1918.

KWANGTUNG: Lofaushan, *E. D. Merrill 10851* (TYPE COLL., NYBG, UC); Lungmen District, Nan Kwan Shan, *W. T. Tsang 25401* (AA), *25438* (AA). KWANGSI: Waitsap District, Tong Shan, *W. T. Tsang 22862* (AA); Yao Shan, *C. Wang 39502* (AA), *40192* (AA).

Scattered shrubs, on mountain slopes at altitudes of about 500–1000 meters, in Kwangtung and adjacent parts of Kwangsi. Flowers pale yellow. Flowering from June to September.

The type of the species was from: "Kwangtung Province, Loh Fau Mountain (Lofaushan), *Merrill 10851*, August 22, 1917, in thickets along small streams, altitude about 950 meters; very rare, a single plant observed." Isotypes in the herbaria of the New York Botanical Garden and the University of California have been seen.

This species is characterized by its large broad leaves with grayish indumentum on the lower surface and the relatively longer and more acuminate calyx-teeth. It has the easternmost range of any species of the genus.

3. **Brandisia laetevirens** Rehder in Sargent, Pl. Wils. 1: 573. 1913.

YUNNAN: Szemao, *A. Henry 12605* (AA TYPE, MBG); Wen-shan District, *H. T. Tsai 51495* (AA); Shih-ping District, *H. T. Tsai 53434* (AA).

A shrub in forests on mountains at altitudes of 1300 to 1800 meters, in southern Yunnan. Flowers yellow. Flowering in January.

The type of the species was from "Yunnan: Szemao, eastern mountains, alt. 1300 m., *A. Henry* (No. 12605)." The holotype in the herbarium of the Arnold Arboretum has been seen.

This species is a close relative of *B. Hancei* and *B. discolor*. It is distinguished from the former by its large, less cordate, and more distinctly petiolate leaves. It differs from the latter notably in the larger calyx and shorter petioles. The corolla of *B. discolor* is also narrower and more densely tomentose and the leaves are darker on the upper surfaces, which become almost black in dried specimens.

4. **Brandisia kwangsiensis** sp. nov.

Frutex scandens, ramulis hornotinis fulvo-tomentosis; foliis chartaceis,

ovato-lanceolatis vel oblongis, longe acuminatis, basi acutis vel subrotundatis, 6–8 cm. longis, 2–3.7 cm. latis, margine integris, supra initio sparse stellato-tomentosis, mox glabrescentibus et glabris, in sicco luteo-viridibus, subtus dense flavescentibus stellato-tomentosis, reticulatis, nervis lateralibus utrinsecus 5–7, adscendentibus conjunctis, supra costa impressa subtus elevata; petiolis 4–8 mm. longis, fulvo-tomentosis; floribus axillaribus, solitariis, pedicellis gracilibus, fulvo-tomentosis, 8–9 mm. longis, medio bibracteolatis, bracteolis subulatis, caducis; calyce campanulato, 10-costato, circiter 1 cm. longo, extus dense tomentoso, intus dense piloso, lobis 5, late triangularibus, acutis, 2–3 mm. longis; corolla late campanulata, leviter curvata, bilabiata, circiter 2.4 cm. longa, rubra, extus dense stellato-tomentosa, limbo intus tomentoso, tubo intus glabro, labio postico magno truncato emarginato, lobo antico 3-lobato, fere dimidio breviore, lobis ovatis acutis; staminibus stylisque corolla subaequilongis; antheris dense pilosis; capsulis ovoideis, dense tomentosis, calyce incluso circiter 1 cm. longis.

KWANGSI: Ling wun District, in dense woods, *S. K. Lau 28688* (TYPE AA); Pin Lam, *S. P. Ko 55685* (AA).

This species is strongly characterized by its relatively narrow leaves with acute to subrounded bases. From other related species, such as *B. Swinglei*, *B. laetevirens*, and *B. discolor*, this new species is also readily distinguished by the nearly concolorous leaves. The upper surfaces of the leaves are only slightly more brownish than the lower, while in the other species mentioned the upper surfaces are much darker and often turn blackish in the dried state. The reddish flowers appear in January.

Besides the two collections mentioned above, another specimen, *R. C. Ching 6300* (NYBG), collected from Nee Bai, Kwangsi, may be referable to this species. On it the leaf-bases are more rounded. The specimen bears only incomplete fruits.

5. **Brandisia discolor** Hook. f. & Thoms. in Jour. Linn. Soc. Bot. 8: 11. *t. 4.* 1865; Kurz in Jour. As. Soc. Beng. 42: 236. 1873, For. Fl. Brit. Ind. 2: 250. 1877; Hook. f., Fl. Brit. Ind. 4: 257. 1865; Brandis, Ind. Trees 491. 1906; Rehder in Sargent, Pl. Wils. 1: 573. 1913.

YUNNAN: Szemao, *A. Henry 12605B* (AA, ANSP, MBG, NYBG), *J. F. Rock 2769* (AA, USNH), *C. W. Wang 80987* (AA, USNH).

A shrub on ridges in bushes at an altitude of about 1300 meters, from lower Burma to southern Yunnan. Flowers yellow. Flowering in March.

The type of the species is a collection made by Brandis in Martaban, Burma, although no collection is definitely cited with the original description.

This species was originally found in lower Burma and the southern Yunnan plants are apparently referable to it. The species is characterized by the slender distinct petioles, strongly darkened upper leaf-surfaces, and the relatively small calyces and narrow corollas.

6. **Brandisia glabrescens** Rehder in Sargent, Pl. Wils. 1: 574. 1913.

YUNNAN: Mengtze, *A. Henry 9716* (AA, USNH), *9716A* (AA TYPE); Ping-pien District, *H. T. Tsai 62440* (AA), *62798* (AA).

A slender shrub, in forests at altitudes of about 2000 2300 meters, in southern Yunnan. Flowers yellow. Flowering in July and August.

Rehder cited two collections: "Yunnan: Mengtze, forest, alt. 2000 m., *A. Henry*

(No. 9176A); south of Red River from Manmei, alt. 2300 m., *A. Henry* (No. 9716)." Both are in the herbarium of the Arnold Arboretum, the first being designated by Rehder as the type. The number, however, should read 9716A.

This species is characterized by the long calyx. Besides this distinct calyx-character, it can also be readily distinguished from the related *B. discolor, B. Hancei,* etc., by the sparsely pubescent leaves, which are rounded to broadly truncate at the base.

7. **Brandisia rosea** W. W. Smith in Notes Bot. Gard. Edinb. 10: 10. 1918.

SIKANG: Tsarong, Salween–Chingkiang Divide, *G. Forrest 20320* (AA, USNH). YUNNAN: Western flank of the Tali Range, *G. Forrest 11565* (AA, RBGE TYPE, UC); Shang-pa District, *H. T. Tsai 54774* (AA), *54859* (AA), *56644* (AA); Che-tse-lo, *H. T. Tsai 54172* (AA), *58548* (AA); Chungtien, Wu-tso on the Yangtze bank, *K. M. Feng 3344* (AA).

In woods or open thickets on mountain slopes at altitudes of 2100 to 3000 meters, in northwestern Yunnan and adjacent Sikang and also in eastern India. Flowers deep rose to reddish orange. Flowering from July to September.

The type of the species is from western Yunnan: "China, western flank of the Tali Range, Yunnan. Lat. 25° 40′ N. Alt. 10,000 ft. Shrub of 3–5 ft. Flowers deep rose. Open dry situations amongst scrub. July 1913. G. Forrest. No. 11,565." The holotype in the Edinburgh Herbarium has been seen.

Brandisia rosea is distinctly characterized by the bilobed calyx. In this respect, it deviates from the original generic limits. It also differs from other species in its general appearance, especially in the relatively narrow long-attenuate leaves which are sometimes oppositely arranged. In view of these differences, it is here segregated as representing a different subgenus. The fruit and seed characters are the same as in the other species.

A variety with yellow flowers was described by Fischer, from Assam, India, as *Brandisia rosea* W. W. Smith var. *flava* C. E. C. Fischer, in Kew Bull. 1934: 93. 1934. In the Genera Plantarum, it is stated that, besides the original *B. discolor,* there is another species in India. Hooker, in the Flora of British India, said: "The supposed second species of *Brandisia,* alluded to in the 'Genera Plantarum' as a native of Bhotan, has stellate tomentum, lanceolate leaves and a 2-lipped calyx, and cannot be congeneric." Fischer identified this plant as belonging to *B. rosea.* He said: "Griffith's specimen [*Kew Dist.* 3748] from Bhutan, referred to in the Gen. Pl. and in the Fl. Brit. Ind., and a sheet collected by Nuttall also in Bhutan (both in the Kew Herb.) are this species, but being in fruit only it cannot be determined whether they represent the typical species or the colour variety."

8. **Brandisia racemosa** Hemsl. in Kew Bull. 1895: 114. 1895; Oliver in Hook. Ic. Pl. 24: *t. 2383.* 1895; Schneider, Ill. Handb. Laubholzk. 2: 618. *fig. 399, c–h.* 1911; Rehder in Sargent, Pl. Wils. 1: 574. 1913; Hand.–Mazz., Symb. Sin. 7: 831. 1936.

YUNNAN: Mengtze, *Hancock s. n.* (UC), *Henry 9973* (AA, MBG, NYBG, USNH), *M. Leduc s. n.* (ANSP); Siao-ho, *E. E. Maire 3986* (ANSP, B); Mongkou, *E. E. Maire 10199* (NYBG, UC); Kiang-pien, *E. E. Maire s. n.* (ANSP); Kiao Kia, *F. Ducloux 989* (NYBG, UC); near Kun-ming, *H. Handel-Mazzetti 5051* (AA, USNH).

A spreading shrub, at altitudes of 800 to 2800 meters, in Yunnan. Flowers scarlet. Flowering in September.

Hemsley's type was from "Western China, in shady copses, Mongtze, Yunnan, *Hancock*, 143." It has not been seen. The description and original illustration by Oliver are distinctive. Two specimens collected by Hancock in the type locality in 1896 are in the herbarium of the University of California.

Brandisia racemosa is a most unique species of the genus, distinguished not only by the peculiar corolla-structure but also by the inflorescence. The flowers are arranged in short or long racemes. The calyx is shortly and inconspicuously 5-dentate. The corolla is strongly bilobed, the upper lip being much longer than the lower. The lower lip is 3-lobed, with the two lateral lobes adnate to the sides of the upper lip midway in the corolla and the middle lobe attached much lower in a deep notch between the two lateral lobes.

The plant also differs from other species of the genus in general appearance, with its long straggling branches and relatively smaller and more distinctly serrate leaves. The whole plant is blackened in the dried state, indicating its possible parasitic or semi-parasitic habit. Rehder mentioned that: "It was introduced by Mr. Wilson into cultivation, but it could not be grown successfully, as it is apparently parasitic and its proper host plant is not known."

Although the plant differs radically from other species of the genus in many respects, its basic characters in the stamens, fruits, and seeds agree with the genus in general. It is thought best to retain it in the genus but to designate a subgenus for its sole accommodation.

Doubtful and excluded species

Brandisia praticola W. W. Smith in Notes Bot. Gard. Edinb. 10: 10. 1918.

This species is based on *Forrest 13350* from northwestern Yunnan. The type, in the Edinburgh Herbarium, is available for study. It proves to be *Pterygiella nigrescens* Oliver.

Brandisia Souliei Bonati in Bull. Soc. Bot. France 56: 467. 1909.

This species is based on *Soulié 5199* from Yargong, Sikang Province. It has not been seen. According to the description, this species is distinguished by the 3-verticillate leaves, which are concolorous on the two surfaces, the flowers in axillary cymes, the membranaceous calyx with its 5 lobes subulate and splitting at the tips, etc. It does not represent the genus *Brandisia* but belongs in the Labiatae. A short discussion of this misplaced species will be issued in this Journal in the near future by Prof. E. D. Merrill.

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THE CYTOGENETICS OF GENERIC HYBRIDS OF SORBUS

HALLY J. SAX AND KARL SAX

With one plate

THE POMOIDEAE constitute a group of rather closely related genera of common origin (Sax, 1933). All genera have a basic chromosome number of 17 and generic hybrids are relatively common. Natural hybridization is most frequent between *Sorbus* and the related genera *Aronia, Amelanchier,* and *Pyrus*. Rehder (1940, 1947) has described or enumerated seven hybrids between *Sorbus* and *Aronia* species, three hybrids of *Sorbus* and *Amelanchier,* and one hybrid between *Sorbus* and *Pyrus*. These genera are closely related and have been included in a single genus *Pyrus* by some taxonomists.

The nomenclature in the following descriptions is that of Rehder (1940). The cytological analysis is based upon acetocarmine smear preparations, following fixation in alcohol-acetic acid.

Hybrids between *Sorbus* and *Aronia* include *Sorbaronia Jackii, S. Arsenii, S. hybrida, S. fallax, S. heterophylla, S. alpina,* and *S. Dippelii.* Both the pinnate- and entire-leaved species of *Sorbus* have produced hybrids with *Aronia species,* all of which have entire leaves. *Sorbaronia Dippelii* has been crossed with *Sorbus alnifolia* in the Arnold Arboretum. Three of the *Sorbaronia* hybrids, *S. Jackii, S. alpina,* and *S. Dippelii,* have been examined cytologically and attempts have been made to grow F_2 generations.

Sorbaronia Jackii is a naturally recurring hybrid between *Sorbus americana* and *Aronia prunifolia*. Specimens of the *Sorbus* parent in the Arboretum, both mature trees and 2-year old seedlings, have from 5 to 8 pairs of leaflets with an average number of slightly less than 7. The F_1 hybrid has variable leaves, ranging from entire, as in *Aronia*, to pinnate leaves with as many as 3 pairs of leaflets in addition to the terminal leaflet. Often the leaves are partially pinnate or lobed. The average number of leaflets is 1.4.

The open pollinated progeny of *S. Jackii* are extremely variable in size and viability. Of 50 seedlings selected from the survivors grown in the greenhouse, seven have died in the nursery at the end of the second year, seven are extreme dwarfs, and 36 have made more or less normal growth. All surviving seedlings have at least partially pinnate leaves, ranging from 3 to 7 leaflets with an average of 4.5. No segregates had any entire leaves, but these progeny may be back cross hybrids with adjacent pinnate-leaved species of *Sorbus*. Seedlings of *Sorbus americana* grown in the nursery showed much greater uniformity than those of the hybrid. Of 50 seed-

lings, only one had died at the end of the second year.

Sorbaronia Jackii produces abundant fruits, but much of the seed is defective or produces weak seedlings — pollen sterility is variable, ranging from 0 in some anthers to about 50 per cent in others.

The meiotic divisions were generally irregular, but in some pollen mother cells the divisions appeared to be relatively normal. At first meiotic metaphase there were from 13 to 15 bivalents and from 4 to 8 univalents in most of the figures examined, although the number of univalents ranged from 0 to 12. Lagging univalents were generally found at both first and second anaphase (PL. I, FIG. 1). The tetrads resulting from the two meiotic divisions were often irregular with some micronuclei, but as a rule nearly 50 per cent of the pollen appeared to be morphologically normal.

Sorbaronia alpina is a cross between *Sorbus Aria*, a species with simple leaves, and *Aronia arbutifolia*. This hybrid, as represented by the variety *super-aria*, is more sterile than *Sorbaronia Jackii*. Occasionally there appeared to be 17 bivalent chromosomes at the first meiotic metaphase, but the divisions were generally quite irregular, with as many as 14 lagging univalents at anaphase. For some anaphase figures the lagging chromosomes appeared to include an occasional bivalent (PL. I, FIG. 2). The second meiotic divisions also were irregular and the pollen fertility ranged from 0 to 24 per cent. For both of these *Sorbaronia* hybrids the pollen sterility varied greatly in different flowers and some anthers contained no good pollen. Some fruits are produced by *S. alpina*, but we have not been able to germinate the seeds.

Sorbaronia Dippelii is a hybrid between *Sorbus Aria* and *Aronia melanocarpa*. This hybrid is relatively fertile, as indicated by both pollen sterility and by fruit development. Yet some anthers produce no good pollen and we have not been able to germinate open pollinated seed. Seventeen bivalent chromosomes were found at meiotic metaphase (PL. I, FIG. 3), and there was little irregularity at meiotic anaphase. Pollen development was variable, but some counts showed as high as 58 per cent normal pollen. The pollen fertility of the *Aronia* parent was only 76 per cent and that of the *Sorbus* parent about the same.

We have succeeded in crossing *Sorbaronia Dippelii* with the distinct *Sorbus* species *S. alnifolia*. This hybrid has the characteristic foliage of *S. alnifolia*, the male parent. It is a slow growing shrub and has not yet flowered.

Several hybrids between *Sorbus* and *Amelanchier* have been described. The three known hybrids are growing in the Arnold Arboretum, but only *Amelasorbus Jackii* is large enough to provide meiotic material. This hybrid was found among seedlings grown from seeds collected in the Moscow mountains of Idaho by Professor J. G. Jack. It is described by Rehder as a hybrid between *Sorbus scopulina* and *Amelanchier florida*. According to Professor Jack there were two types of the hybrid, one with partially pinnate leaves and one with only an occasional cleft or lobed leaf. Only the latter type is now available in our collections.

Amelasorbus has been difficult to analyse cytologically. The microspore mother cells appear to disintegrate at any stage of development from prophase to microspores. In favorable prophase preparations 32–34 chromosomes were counted at diakinesis, indicating a very loose association of paired chromosomes. At meiotic metaphase there were from 12 to 15 bivalents and from 4 to 10 univalents (PL. I, FIG. 4). At anaphase the number of lagging univalents are variable, but as many as ten have been observed (PL. I, FIG. 5). Although the meiotic behavior of the chromosomes of *Amelasorbus* is similar to that of two of the *Sorbaronia* hybrids, the sterility is much greater. Practically no normal pollen is formed and very little fruit is produced. Over a period of years only two viable seeds have been obtained and the resulting seedlings, which have now flowered for several years, are very similar to the parental hybrid in both appearance and sterility. Apparently they are of parthenogenetic origin.

Two other forms of *Amelasorbus* are listed by Rehder (1947). *Amelasorbus Hoseri* is thought to be a hybrid between *Sorbus hybrida* and *Amelanchier* sp. It has partially pinnate leaves. *Amelasorbus Raciborskiana* is listed as a cross between *Sorbus* sp. and *Amelanchier asiatica*. It too has partially pinnate leaves. Both of these hybrids were raised at the Kornik Botanical Garden in Poland and named by Wroblewski. Our specimens of these hybrids are not sufficiently mature for meiotic analysis.

The known crosses between *Sorbus* and *Pyrus* are limited to *Sorbopyrus auricularis*, a natural hybrid between *S. Aria* and *P. communis*. We have in the Arnold Arboretum only the variety *bulbiformis*, a form which resembles *Pyrus* in most characters. This hybrid is a triploid with presumably two sets of pear chromosomes. Its cytological behavior has been described earlier (Sax 1932). We have obtained some progeny from open pollinated seeds of *Sorbopyrus*. The seedlings are variable but tend to segregate into two groups — some which are vigorous and resemble the mother tree, and a series of dwarf segregates which survived for one to three years.

In all of these generic hybrids involving *Sorbus* there is considerable sterility, and when segregates are obtained many are weak and do not survive. The genera *Sorbus, Aronia, Amelanchier,* and *Pyrus* can be crossed only in certain combinations. One might suppose that *Aronia* and *Amelanchier* could be crossed, since both have produced at least several hybrids with *Sorbus,* but repeated attempts to cross these genera have failed. However, we also have been unable to produce any artificial hybrids between *Aronia* and *Sorbus,* and yet seven such spontaneous hybrids are known and some are recurrent in nature.

The fact that *Sorbus, Aronia, Amelanchier,* and *Pyrus* can be crossed in certain combination indicates a certain degree of similarity. The behavior of the hybrids does indicate cytogenetic differentiation usually found in diverse species. Whether such incompatibility merits more than specific differentiation is a matter of taxonomic convenience.

SUMMARY

Natural hybrids between *Sorbus* and *Aronia* and between *Amelanchier* and *Pyrus* are partially sterile and show considerable meiotic irregularity. *Sorbaronia* produces a variable progeny both in morphological characters and viability. *Amelasorbus* produces few viable seeds and the progeny appear to be of parthenogenetic origin. *Sorbopyrus* sets few seeds and the progeny include many dwarf segregates which survive for only a few years. The cytogenetic analysis indicates a common origin of these genera, but a degree of differentiation sufficient to maintain generic isolation.

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EXPLANATION OF THE PLATE

Drawn from acetocarmine preparations. Magnification approximately × 2000.

FIG. 1. *Sorbaronia Jackii*. First meiotic anaphase. FIG. 2. *Sorbaronia alpina super-aria*. First meiotic anaphase. FIG. 3. *Sorbaronia Dippelii*. First meiotic metaphase. FIG. 4. *Amelasorbus Jackii*. First meiotic metaphase. FIG. 5. *Amelasorbus Jackii*. First meiotic anaphase.

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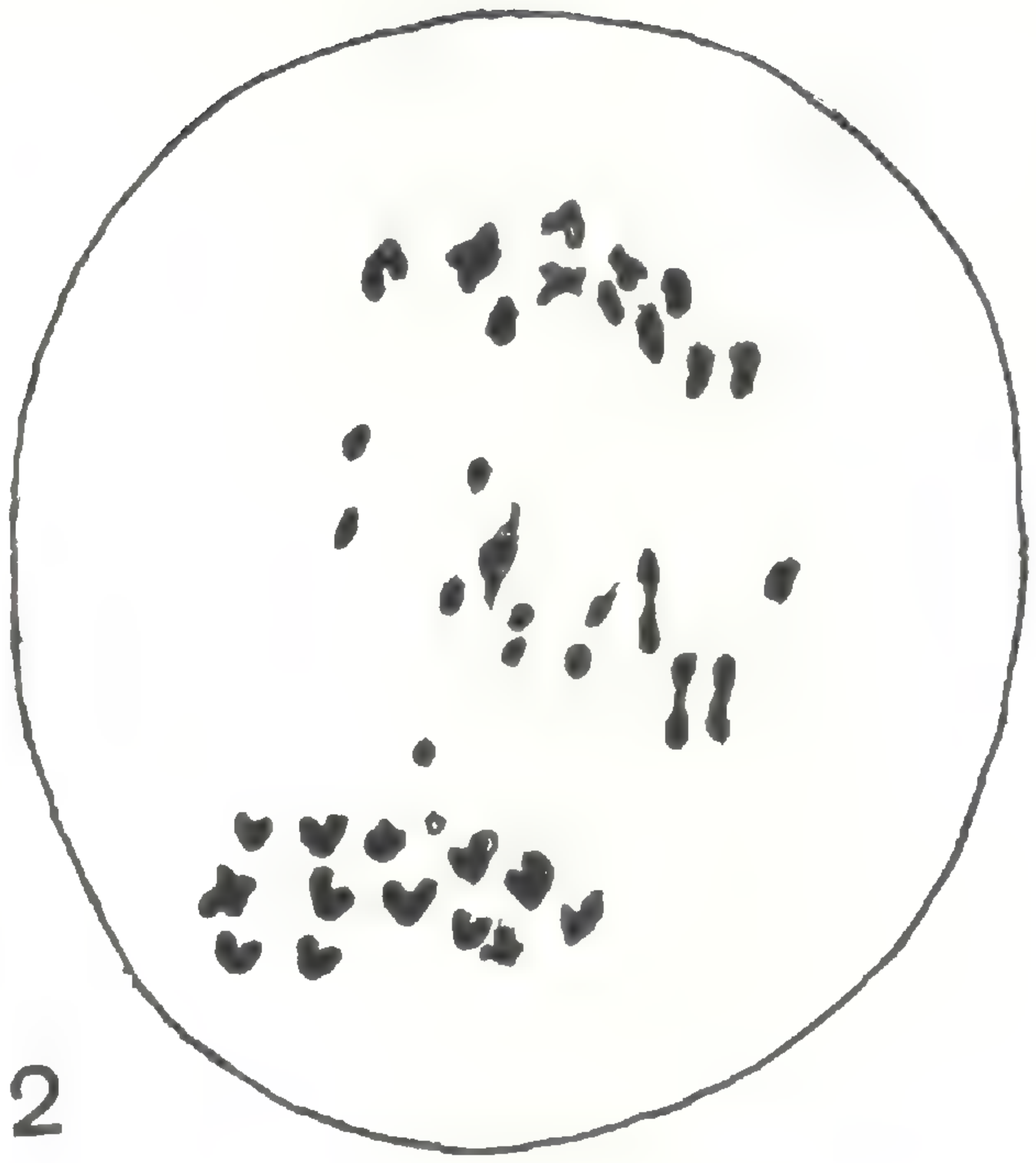
1



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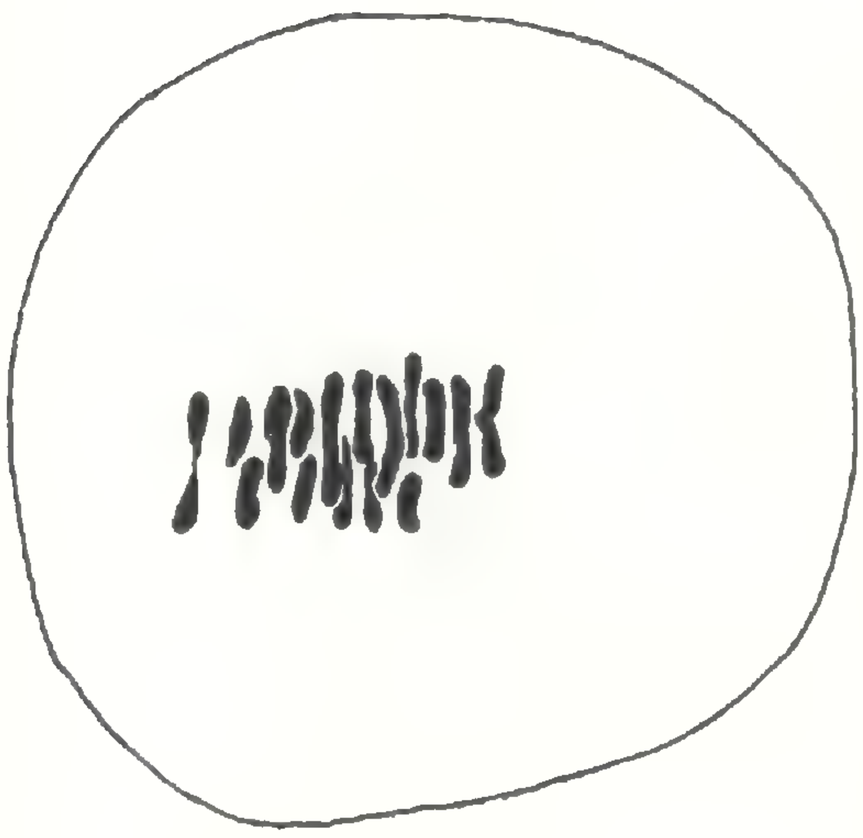

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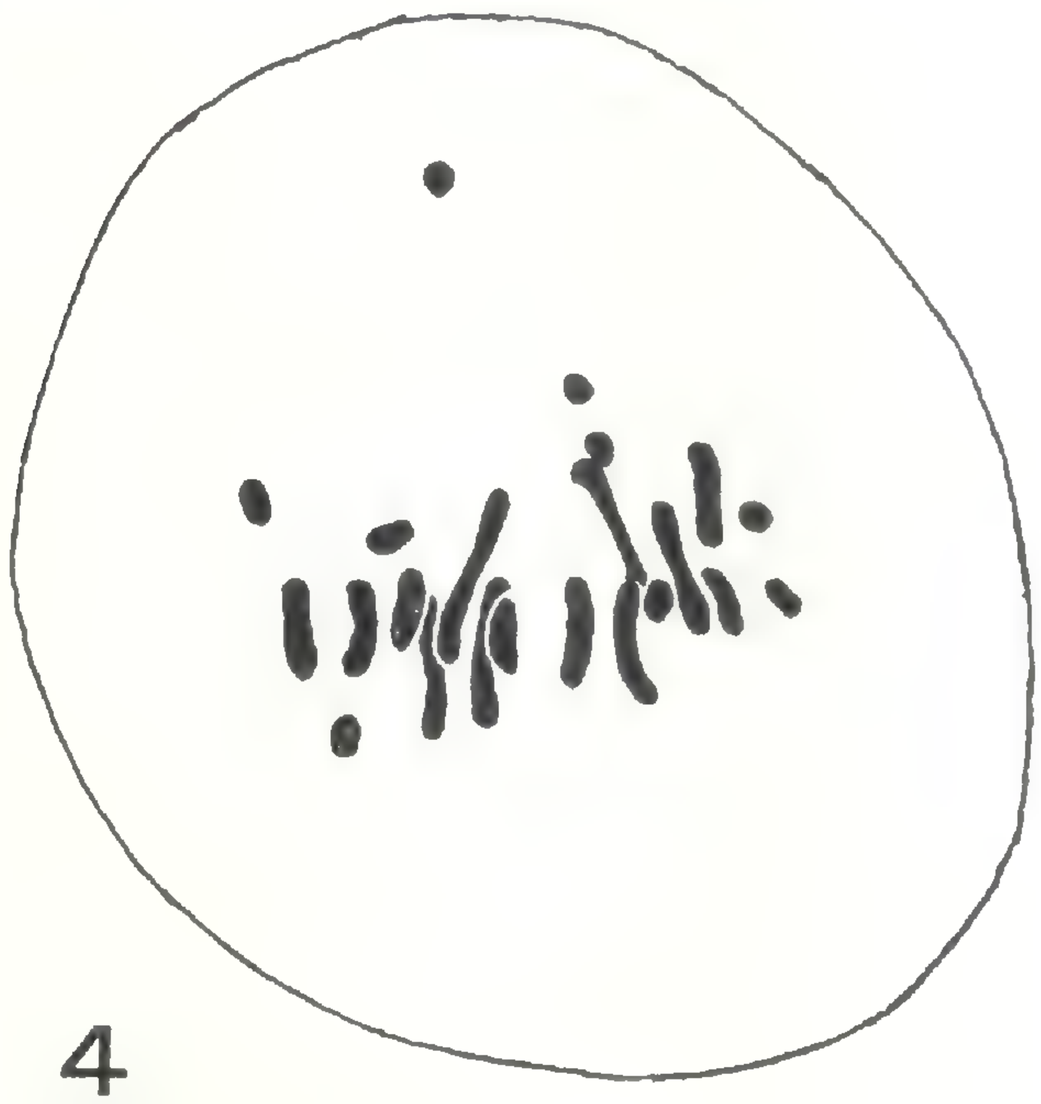

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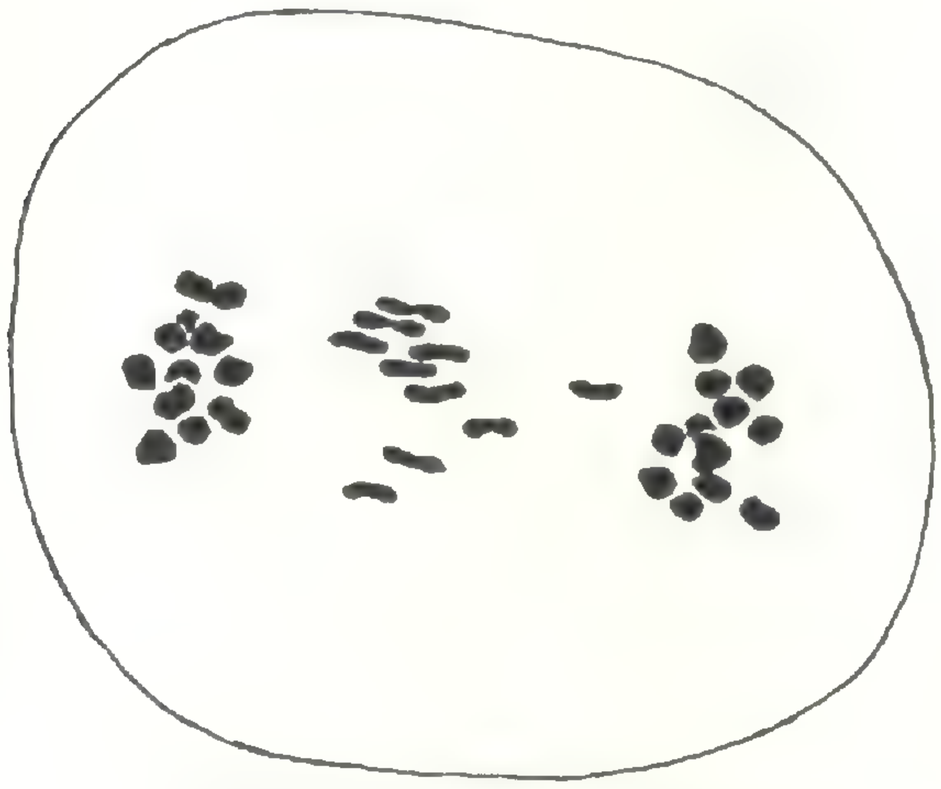

5

GENERIC HYBRIDS OF SORBUS

A FIJIAN ACMOPYLE

JOHN T. BUCHHOLZ AND NETTA E. GRAY

With one plate

AMONG the collections of John W. Gillespie from the Fiji Islands is a single specimen (no. *3273*, from Namosi Province, Viti Levu) which represents a species of *Acmopyle*. This specimen had been included in a loan of material of *Podocarpus* from the herbarium of the Arnold Arboretum and had been inadvertently identified as *Podocarpus vitiensis* Seem. It differs in many important features, both externally and internally, from *P. vitiensis*, and it agrees so generally in the anatomy of the leaves with *Acmopyle* Pilger that there can be no doubt about the generic identity. Specifically it differs somewhat from *Acmopyle Pancheri* (Brongn. & Gris) Pilger in several details, such as the external shape of the leaves and their texture, width, and apex.

This is not the first report of *Acmopyle* in the Fiji Islands. Sahni (in Phil. Trans. Roy. Soc. London B, 210: 253–310. 1920), in his treatise on the structure and affinities of *Acmopyle*, mentions an earlier collection by J. Horne in 1877–78, found in the herbarium of the Royal Botanic Gardens, Kew, which he examined in considerable detail. Sahni concluded that this specimen represents a species of *Acmopyle*. He also records the opinion of Dr. Stapf, who examined this material and who "does not consider it likely that the Fiji specimen is specifically identical with *Acmopyle Pancheri*, but he agrees to the generic identity."

We have examined the leaves of the Gillespie specimen histologically, and also those of *Acmopyle Pancheri*, numerous specimens of *Dacrydium falciforme* (Parl.) Pilger, and some of *Dacrydium taxoides* Brongn. and Gris. Details given by Sahni concerning the flattening of the leaf in these species in the vertical plane, with the vascular bundle remaining in an unchanged orientation, can be substantiated in all essentials. The vascular bundles therefore appear as if turned sidewise through 90° with reference to the leaf surface. The above mentioned two species of *Dacrydium*, representing a special section of that genus, and the two species of *Acmopyle* share in this unusual type of leaf. Leaves of the *Dacrydium* spp. possess hypoderm and are bifacial, having palisade tissue and stomates on both sides, while the leaves of *Acmopyle* found on the pectinate twigs of the last order of branching have very little or no hypoderm, palisade tissue only on the upper side which is exposed to light, and the stomates confined almost entirely to the lower surface of the leaf. The unique type of leaf anatomy therefore serves to segregate *Acmopyle* from other genera of the Podocarpaceae.

Acmopyle Sahniana sp. nov.[1]

Arbor parva; foliis spiraliter insertis, in ramulis ultimis biseriatim in una planitie expansis, basi in ramulum longe decurrentibus; laminis falcatis, 16–19 mm. longis, 3.5–4 mm. latis, supra nitido-viridibus, marginibus foliorum subparallelibus sed in apicem oblique acutum terminantibus, costa supra non conspicua; floribus masculis seminibusque ignotis.

Leaves with two bands of stomates in 14–18 irregular rows each beneath, interrupted only slightly at midvein and leaving wide non-stomatiferous bands at borders; single vascular bundle within leaf turned through 90°, the xylem toward the adaxial margin, the phloem and single resin canal toward the abaxial margin of the leaf.

FIJI ISLANDS: VITI LEVU: Namosi: Mt. Vakarongasiu, alt. 900 m., on an exposed ridge, *John W. Gillespie 3273* (TYPE in herb. Arnold Arb.), Oct. 2, 1927.

Acmopyle Sahniana may be distinguished from *A. Pancheri* (Brongn. & Gris) Pilger by the wider leaves, the more nearly parallel leaf-margins, and the obliquely acute apex. The leaves of *A. Pancheri* are usually 2.5–3.5 mm. wide, are gradually narrowed toward the tip, have a narrow rounded apex, and are thicker. Both species have the vascular bundle turned through 90° and are without hypoderm or have only scattered fibers of hypodermal tissue near the midvein of the leaves. The midvein is not centrally placed in *A. Sahniana*. The wider margin is in the adaxial position and this convex adaxial edge near the base of leaf is much thinner than in *A. Pancheri*.

OTHER SPECIMENS EXAMINED FOR COMPARISON[2]

Acmopyle Pancheri (Brongn. & Gris) Pilger

NEW CALEDONIA: Mt. Mou, *I. Franc 170* (A, US), *Le Rat 2594* (A), *Louisa Clark Williams 149* (Bish).

Dacrydium taxoides Brongn. & Gris

NEW CALEDONIA: Cougui, *Pancher 379* (NY).

Dacrydium falciforme (Parl.) Pilger vel aff.

Group A. Specimens resembling the original descriptions: MALAY PENINSULA: *R. E. Holttum* (Singapore field no. *20626*) (UC); PAHANG: Fraser Hill, 4000 ft., Aug. 25, 1923, *M. Nur 10507* (A). BORNEO: BRITISH NORTH BORNEO: Mt. Kinabalu, Marai Parai, *M. S. Clemens 10962* with seed (UC), *J. & M. S. Clemens 33078* (A, UC); Mt. Kinabalu, Penibukan, *J. & M. S. Clemens s. n.* (A); SARAWAK: Mt. Poi, *J. & M. S. Clemens 20263* (A); NETHERLANDS BORNEO: Res. Wester-Afdeeling, Bengkajang, Banan, *Neth. Ind. For. Service 24778* (A); (locality?), Batu Gajah Lugga, *B. W. Hullett 5695* (A). CELEBES: Res. Manado, Paleo, 1400 m., *Neth. Ind. For. Service 17544* (A). PHILIPPINES: MINDORO: Mt. Halcon, *E. D.*

[1] Named in honor of Professor Birbal Sahni, F. R. S., of Lucknow, India, in recognition of his comprehensive study of the morphology of this genus. Prof. Sahni, also distinguished through his researches in paleobotany, was born in India in 1891 and was educated at Punjab and at Cambridge (Eng.) Universities. He is now Professor of Botany and Dean of the Faculty of Science at the University of Lucknow.

[2] Place of deposit of specimens is shown by the parenthetical letters, as follows: (A) Arnold Arboretum; (Bish) Bernice P. Bishop Museum; (NY) New York Botanical Garden; (UC) University of California; (US) United States National Herbarium.

A FIJIAN ACMOPYLE

Merrill 5744 (NY); LUZON: Mt. Umingan, *M. Ramos & G. Edaño 26394* (A, NY); *G. Edaño,* Philip. Nat. Herb. no. *4508* (A).

Group B. Specimens with leaves smaller than those of Group A: NEW CALEDONIA: Mt. Mou, *C. J. Pitard 2091* (A, NY). BRITISH NEW GUINEA: *C. E. Lane-Poole 397* (smallest leaves) (A).

EXPLANATION OF THE PLATE

A. *Acmopyle Sahniana,* from Viti Levu, Fiji Islands, *Gillespie 3273* (A).
B. *Acmopyle Pancheri,* a twig from *Williams 149* (Bish), for comparison.

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A MONOGRAPH OF THE GENUS STREBLOSA KORTHALS (RUBIACEAE)

C. E. B. BREMEKAMP

With two text-figures

INTRODUCTION

KORTHALS DESCRIBED in his "Overzicht der Rubiaceën van de Nederlandsch-Oostindische Kolonien" (in Ned. Kruidk. Arch. 2 (2): 245. 1851) i.a. a new genus *Streblosa*, to which he referred Blume's *Psychotria tortilis* and two species based on specimens which he had collected himself in Sumatra and Borneo. Although he gave no explanation of the name, we may safely assume that it refers to the peculiar arrangement of the flowers along the branchlets of the inflorescence which they encircle in the same way in which the shoot of a winding plant twines round its support. Blume's epithet *tortilis* too was apparently inspired by the arrangement of the flowers.

Korthals' generic description contains several inaccuracies; the calyx is not 5-dentate but 5-fid or, more rarely, 5-partite, the corolla-tube is not infundibuliform but cylindrical or, sometimes, in the upper half narrowly campanulate, and it is not glabrous inside but provided with a ring of hairs or with five hair-bundles, the aestivation of the lobes is not subvalvate but quite simply valvate, the ovules are neither peltate nor attached to the centre of the septum but ascending from the inner angle of the ovary-cells, the pyrenes are not plane on the inside but provided with two quite conspicuous contiguous excavations, and the embryo is not amphitropous but straight; the plants moreover are not fruticose but herbaceous, and their inflorescences are not axillary but at first terminal and subsequently pseudo-axillary.

The generic description is followed by a note in which he gives an exposition of the reasons which induced him to separate this genus from *Psychotria*. It is reproduced here in English translation: "On account of

their habit it seemed to me that the generic identity of the species here referred to *Streblosa* with species belonging either to *Psychotria* or to *Grumilea*, already looked dubious, for they differ from them in their membranous, reticulately veined leaves and in the peculiar corymbose inflorescence. The analysis of the flower revealed, in addition to a number of identical features, in the structure of the ovary a diagnostic character of sufficient importance: whereas in *Psychotria* the ovules arise from the bottom of the cells, they are in *Streblosa* attached to the centre of the septum and peltate." The argument derived from the position of the ovules, by which Korthals apparently set great store, and which he thought would justify the creation of the new genus before the tribunal of his fellow botanists, unfortunately was based on inaccurate observation: in reality the ovules of *Streblosa* arise just like those of the other Psychotrieae from the inner angle of the ovary-cells.

Miquel already had some doubts with regard to Korthals' description of the position of the ovules. In his "Flora Indiae Batavae" (2: 294. 1857) he reduced the genus to a subdivision of *Psychotria* for which he retained the name *Streblosa* and which he characterized with the aid of the data provided by Korthals. An interrogation mark, however, is put behind the words with which the attachment of the ovules to the middle of the septum is described. Afterwards Miquel's valuation of the distinguishing characters underwent a change, for in his "Ecloge Rubiacearum Archipelagi Indici" (in Ann. Mus. Bot. Lugd.-Bat. 4: 211. 1869) the genus is reëstablished. As no generic description is given, and as no comment is made on this change of attitude, it is impossible to say how the latter was brought about. It is noteworthy that Miquel corrected in this work Korthals' assertion with regard to the habit of *Str. tortilis* (Bl.) Khs: he himself describes it as an herbaceous plant. Of the two new species described by Korthals only one, the Sumatran *Str. polyantha,* was found by Miquel in the Leiden herbarium (l.c. 262); it seems that the specimen on which the other species, the Bornean *Str. undulata,* was based, had disappeared already, and the type of *Str. tortilis* var. *β*, collected by Korthals on G. Singalang in West Sumatra, which is said to differ from the form described by Blume in its sessile inflorescences and elliptic leaves, was not met with either; in contradistinction with *Str. undulata* (v. infra) it has never again been mentioned in literature. It may have have been conspecific with one of the Sumatran species dealt with below, but nothing definite can be said with regard to its identity.

Hooker f. reduced *Streblosa* in Benth. et Hook. f., Gen. Pl. 2: 124, 125. 1873, to *Psychotria:* as this author attached great importance to the position of the ovules, it is unlikely that he would have made this reduction if he had not convinced himself of the inaccuracy of Korthals' description. The type-species was referred by Hooker to the section Mapouria (a ebracteatae), where it occupies on account of the persistent bifid stipules, the cincinnate arrangement of the flowers, the small green fruits and the two contiguous excavations on the ventral side of the pyrenes, a most

anomalous position. Korthals' other species are not mentioned, but a plant collected in Penang and in the Wallich herbarium, inserted under the provisional name *Psychotria microcarpa* Wall., is declared conspecific with *Ps. tortilis* Bl., an error which was repeated by King and Gamble in their "Materials for a Flora of the Malay Peninsula" (in Jour. As. Soc. Beng. 72 (2): 11. 1906) and by Ridley in his short survey of the genus *Streblosa* in Jour. As. Soc. Straits 57: 62. 1911. It was corrected by the latter in his "Flora of the Malay Peninsula" (2: 148. 1923).

Baillon referred *Streblosa* in Adansonia 12: 325. 1879 and in his "Histoire des Plantes" (7: 285. 1880) to *Uragoga* L., which in his delimitation is an even more unwieldy genus than *Psychotria* L. in that of Hooker, and it is therefore not necessary to discuss this reduction. It is noteworthy, however, that he corrected Korthals' assertion with regard to the aestivation of the corolla-lobes. Writing of *Str. tortilis* he stated in Adansonia: "Sur les échantillons que nous avons pu examiner, toutes les corolles étaient simplement valvaires."

Schumann made no mention of the genus *Streblosa* in his monograph of the family in Nat. Pflanzenfam. 4: 4. 1891; and in the "Nachträge" to this work too I have vainly looked for any reference to it. In Dalla Torre & Harms, Genera Siphonogamarum, 503, 1905, however, it is included among the synonyms of *Psychotria*.

Stapf was, after Miquel, the first to recognize the generic distinctness of Korthals' genus. In his paper on the flora of Mt. Kinabalu (in Trans. Linn. Soc., Bot., II. 4: 182. 1894) he described a new species, *Str. urticina*, and expressed himself with regard to its generic position in the following terms: "I think *Streblosa* should be kept up as a distinct genus on account of its peculiar habit, which is produced chiefly by the herbaceous growth, by the very thin leaves, the axillary inflorescences (which in the present species resemble very much those of a common nettle), and by the minute flowers and fruits. Miquel says of *Streblosa* 'frutices'; but the specimens of *S. tortilis* (Bl.) Korth., the only species seen by him, are decidedly herbs. The genus *Streblosa* is limited to Malaya." The statement that the inflorescences are axillary, is incorrect: in reality they are terminal but soon pushed aside by an axillary branch developing in the axil of one of the two highest leaves. The reference to Miquel is incomplete: in the "Flora Indiae Batavae" the latter merely repeated Korthals' statement, but in his paper in the "Annales" he described *Str. tortilis* correctly as "herba basi radicans."

The next author who recognized *Streblosa* as a distinct genus, was Valeton. In Bot. Jahrb. 44: 568. 1910, he described a new species, *Str. glabra*, based on a specimen collected by Winkler (Breslau) in South-east Borneo; it appears very close to *Str. urticina* Stapf. At the same time he gave a more detailed description of *Str. undulata* Khs., based on some other specimens collected by Winkler in the same region as *Str. glabra* and as Korthals' type. Whether these specimens really are conspecific with the latter, is difficult to say, because of Korthals' incomplete description, but

it should be noted that the leaves are elliptic according to Korthals, whereas Valeton states that they are 90–120–150 mm. × 35–50 mm., which means that they are lanceolate in his specimens. However, as there is little chance that Korthals' type will ever be recovered, and as there is otherwise nothing in his description which positively excludes the possibility that his type was conspecific with the specimens described by Valeton, the latter's interpretation may perhaps be accepted.

At about the same time *Ridley* (in Jour. As. Soc. Straits 57: 62. 1911) devoted a few pages to *Streblosa*. He agreed with Stapf that the genus should be restored, but no new arguments were brought forward to support this view. He recognized seven species, i.e. apart from the three for which the genus was created and the one described by Stapf, three new ones. Of these three the first, *Str. hirta*, is probably identical with *Str. polyantha* Khs., of which Ridley had seen no material. The only difference which I can find in comparing Korthals' specimens with Ridley's description, lies in the slightly narrower leaves (10–15 cm. × 3.7–5.0 cm. instead of 9–12 cm. × 4.5–5.7 cm.). In the description of *Str. pubescens* Ridl. there are a few points which make the position of this species altogether dubious: the stipules are said to be lanceolate-acuminate, whereas in this genus they are always two-lobed; the stamens should be inserted near the base of the tube instead of in the ring of hairs in the middle or somewhat above the middle, the stamens as well as the style should be included, whereas the flowers of *Streblosa* are always heterostylous with either the stamens or the style exserted, and the disc is said to be composed of 5 reniform bodies, whereas I found it in *Streblosa* always semi-globose or annular with a single, more or less distinct, transverse impression on the top. For the time being, therefore, I consider *Str. pubescens* a "species incertae sedis." The third species, *Str. bracteata*, on the other hand, is a true representative of the genus, probably nearly related to the plant afterwards described by Merrill under the name *Str. myriocarpa*. Like the latter it is found in West Borneo. Ridley remarked with regard to *Str. urticina* Stapf that he saw in the herbarium of the Botanic Gardens, Singapore, a specimen collected by Haviland and bearing the number of the type, which was "decidedly woody," whereas Stapf described it as "herbaceous and scandent." Ridley was right in so far that the plant is certainly no climber, and that it is woody at the base: as secondary thickening, however, is by no means uncommon in the basal parts of the stems of dicotyledonous herbs, this is no valuable argument against its herbaceous character.

In the following year Elmer (Leafl. Philipp. Bot. 4: 1356. 1912) published some remarks on a plant which he had collected in the island Palawan, and which he referred to *Str. glabra* Val. It differs, however, conspicuously from the latter by the nature of the stipules, whose lobes are separated from each other by a rather wide gap instead of being contiguous. His remarks contain several mistakes: the valvate corolla-lobes are described as imbricate and slightly twisted from left to right;

the stamens are said to be inserted in the basal part of the corolla-tube, and the anthers should be more or less united, the stigma "submitraform," the ovary "superior or nearly so, surrounded by 5 lobular disk appendages," and the ovules should be pendulous. That the genus is said to be monotypic and previously known from Borneo only, may be regarded as a slip of the pen.

In the same year Valeton (in Icones Bogorienses 4: 139, t. 343. 1912) published a detailed description of *Str. tortilis* (Bl.) Khs., accompanied by a plate which unfortunately is not entirely satisfactory. His ideas on the generic characters are summarized in the following sentence: "Le port de la plante, les inflorescences axillaires, l'insertion scorpioide des fleurs sur les rameaux (voir la figure 2 dans la table citée de Stapf) et la structure du fruit sont autant de caractères de valeur générique et qui séparent la *Streblosa* du genre *Psychotria*." Valeton therefore was the first to recognize the taxonomic importance of the monochasial structure shown by the ultimate ramifications of the inflorescence, and although he calls the latter here for sake of convenience axillary, the remarks in his paper in Bot. Jahrb. 44: 568. 1910, show that he knew very well that they are in reality at first terminal and afterwards pseudo-axillary.

A few years later Merrill (in Philipp. Jour. Sci. Bot. 10: 141. 1915) described under the name *Str. axilliflora*, a new species from the Philippines. In a short note attached to the description he remarks: "I am in agreement with Valeton and with Ridley in considering *Streblosa* Korthals to be a valid genus. In aspect the plants are entirely different from *Psychotria* and *Grumilea*, and the differential characters appear to be constant. From all our representatives of *Psychotria* and *Grumilea* the present species is distinguished by its minute fruits and axillary inflorescences; surely, if *Grumilea* is to be separated from *Psychotria*, there are as great or greater reasons for distinguishing *Streblosa* as a valid genus." Merrill afterwards (Enum. Philipp. Fl. Pl. 3: 564. 1923) identified the Philippine species with *Str. glabra* Val., but this was an error: it differs from the Bornean species in the same way as the plant collected by Elmer in Palawan, the stipular lobes namely are not contiguous but separated from each other by a rather wide gap, and the internodes are ecostate.

Since then one new species was described from the Malay Peninsula by Ridley and eight from Sumatra and Borneo by Merrill. With regard to our knowledge of the generic characters however, no further progress was made. In this paper a detailed analysis of the generic characters is given. Twenty-five species are described, and an attempt is made to arrange them in a more or less natural sequence. Eleven of the twenty-five species are new, whereas three of the old ones, namely *Str. hirta* Ridl., *Str. platyphylla* Merr. and *Str. puberula* Merr. are reduced to synonymy, and one, *Str. pubescens* Ridl., set apart as a "species incertae sedis." Of *Str. urticina* Stapf and of *Str. palawanensis* Brem. two varieties are recognized, and of *Str. axilliflora* Merr. three.

GENERIC DESCRIPTION

Streblosa Khs. in Ned. Kruidk. Arch. 2 (2): 245. 1851; Miq. in Ann. Mus. Bot. Lugd.-Bat. 4: 211, 262. 1869; Stapf in Trans. Linn. Soc. Bot. II, 4: 182. 1894, Val. in Engl., Bot. Jahrb. 44: 567. 1910; Ridl. in Jour. As. Soc. Straits 57: 62 1911; Val. in Ic. Bog. 4: 141. 1912; Elmer, Leafl. Philipp. Bot. 4: 1356 1912, Merr. in Philipp. Jour. Sci. Bot. 10: 141. 1915, Enum. Philipp. Fl Pl. 3: 564. 1923; Ridl., Fl. Mal. Pen. 2: 148. 1923; Merr. in Univ. Calif. Publ. Bot. 15: 288. 1929; Lemée, Dict. Pl. Phan. 6: 335. 1935; Merr. in Mitt Inst. Allg. Bot Hamburg 7: 295. 1937, in Papers Mich. Acad. Sci. 22: 194. 1938.

Psychotria spec. Bl., Bijdr. Fl. Ned. Ind. 958. 1826; DC., Prodr. 4: 520 1830, Miq., Fl. Ind Bat. 2: 294. 1857, Suppl. 223, 1860; Hook. f. in Benth. et Hook f., Gen. Pl. 2: 124, 125. 1873; Boerl., Handl. Fl. Ned. Ind. 2 (1): 139. 1899; Dalla Torre & Harms, Gen. Siph. 503. 1905; King & Gamble in Jour. As. Soc. Beng. 72 (2): 11. 1906.

Uragoga spec. Baill. in Adansonia 12: 325. 1879; Hist. Pl. 7: 285. 1880.

Genus *Psychotricarum* caule sympodiali plerumque simplici, inflorescentiis primum terminalibus, deinde pseudo-axillaribus et ergo semper solitariis ad nodos, ramulis ultimis inflorescentiae quoque nodo floribus duobus instructis, florum paribus cincinnaliter dispositis, fructibus parvis et viridibus, globosis vel didymis, in mericarpia duo discindentibus, mericarpiis drupaceis, pyrenis dorso 3-costatis, facie ventrali excavatis et excavatione a carina mediana plus minusve distincta in partes duas divisa a generibus aliis ad tribum hanc pertinentibus distinguendum.

Herbae plerumque simplices, raro semel vel bis pseudo-dichotome furcatae, erectae vel saepius ascendentes, casu quo parte decumbente haud raro radicante et interdum ex axillis innovationes emittente. Caulis sympodialis. Folia opposita, quoque pari aequalia, petiolata; petiolus foliorum inferiorum plerumque satis longa et foliorum aliorum gradatim longitudine decrescens; lamina magna, plerumque tenuis, discolor, supra semper idioblastis in appendicem lenticularem vel conicam productis vix conspicue et interdum cellulis resiniferis valde conspicue punctata, subtus haud raro protuberantiis stomatiferis albido-lepidota, venulis paucis, laxe reticulatis. Stipulae interpetiolares in lobos duos exeuntes. Inflorescentiae plerumque plures quarum una terminalis et aliae solitariae ad nodos, i.e. primum terminales sed mox a ramulo axillari qui folia bina et inflorescentiam novam prodet in positionem pseudo-axillarem coactae, breviter vel rarius longe pedunculatae, ramulis plerumque 3 vel 5, subumbellatis, infimis interdum iterum in ramulos 3 divisis, casu quo ramuli 9 paniculatim dispositi, ramulis ceterum haud raro semel dichasialibus, ramificationibus monochasialibus, raro inflorescentia tota semel vel bis dichasialis, ramificationibus monochasialibus, vel tota monochasialis. Monochasia quoque nodo floribus duobus instructa, florum paribus cincinnaliter dispositis. Bracteae forma et magnitudine diversae sed semper evolutae, interdum ad anthesin deciduae. Flores pedicellati vel subsessiles, semper 5-meri et heterostyli. Ovarium biloculare, loculis ovulo singulo ex angulo interiore ascendente instructis. Calyx plerumque 5-fidus, lobis triangularibus, ovato-triangularibus vel rotundatis, rarius 5-partitus, casu quo lobis interdum imbricatis. Corolla alba, maxime 8 mm. longa sed plerumque multo brevior, breviter hypocrateriformis, tubo interdum dimidio superiore paulum inflato, lobis valvatis, tubo intus ad medium vel supra medium annulo vel fasciculis 5 pilorum instructo. Stamina in annulo vel

inter fasciculos pilorum inserta, in flore longistylo subinclusa, in flore brevistylo exserta; filamenta glabra; antherae oblongae, dorsifixae. Granula pollinis globosa, minute reticulata, 3-pora. Discus semi-globosus vel annularis, apice interdum sulco instructus, glaber. Stylus glaber, in flore brevistylo inclusus, in flore longistylo exsertus; stigmata filiformia vel linearia, patentia, in flore longistylo apice recurvata. Fructus parvus, minus quam 3 mm. diam., viridis, globosus vel didymus, calyce persistente et disco plus minusve exsiccato coronatus, in mericarpia duo discindens; mericarpia drupacea; pyrenae dorso 3-costatae, facie ventrali excavatae, excavatione a carina mediana plus minusve distincta in partes duas divisa, endocarpio tenui. Semen endocarpio conforme, testa rubra vel rubro-maculata, albumine uniformi corneo, embryone recto parvo, radicula inferiore.

Species adhuc notae 25, distributae in Peninsula Malayana, Sumatra, Java, Borneo, Insulis Filippinis, ubi in umbris nemorum crescunt.

SPECIES TYPICA: *Str. tortilis* (Bl.) Khs.

The stems are either erect or, more often, ascending, and there is doubtless a certain amount of vegetative propagation, young plants developing sometimes from the axils of the fallen leaves in the decumbent and rooting basal part. Even in those species that are provided with erect stems, for instance in *Str. Johannis-Winkleri* Merr., in which this kind of growth is perhaps most pronounced, I have sometimes found remains of old shoots at the base of the young ones. I suppose that in these plants the whole stem sinks down after the last fruits have ripened, and that here too new stems develop from axillary buds. That these innovations are but rarely met with in herbarium specimens, probably means that they are not regularly formed. In some of the species with ascending stems, especially in those in which the leaves do not show much difference in shape and size, e.g. in *Str. tortilis* (Bl.) Khs. and in *Str. bullata* Merr., development might even be continuous, the oldest part of the stem gradually decaying and the bent at the same time shifting in the direction of the younger parts: in such species innovations are perhaps formed only when the normal development in some way or other is checked.

Ramification is extremely rare: so far it has been observed in three species only, in *Str. lampongensis* Brem., *Str. chlamydantha* Brem. and *Str. longiscapa* Brem. It is always brought about in the same way, namely by the development of two axillary shoots instead of one at the base of an inflorescence. This is rather interesting from a morphological point of view, for it definitely proves the terminal nature of the inflorescence: without the evidence of the forked plants the latter would always remain somewhat dubious, for the terminal position of the young inflorescence might be spurious, and the presence of but one inflorescence at each node is in itself no sufficient proof.

In habit the *Streblosa* species therefore are not unlike those belonging to the genus *Notopleura* Brem. (*Psychotria* L. sect. *Notopleura* Hook f. in Benth. & Hook. f., Gen. Pl. 2: 124. 1873, cf. Brem. in Rec. d. trav. bot. Néerl. 31: 289. 1934), for the species of that genus too are herbaceous and

provided with usually simple, sympodial stems, the terminal inflorescence being pushed aside by an axillary shoot developing from the axil of one of the leaves at its base. In other respects, however, there are important differences. In *Notopleura* the leaves are succulent, the stipules undivided, the inflorescences paniculate or corymbose, the flowers ebracteate, the corolla-lobes imbricate, and the pyrenes dorsiventrally compressed and on the inner side flat or provided with a prominent keel; the genus, moreover, is confined to Tropical America. The affinity between *Streblosa* and *Notopleura*, therefore, must be regarded as rather remote.

Although the stems probably do not last for more than a few months, there is often a considerable amount of secondary thickening in their basal parts. As a rule the increase is almost entirely due to the formation of secondary xylem, but in the species described below under the numbers 1–11, there is also a considerable development of secondary bast. The formation of cork is, as a rule, but weak, and in most species the stem, therefore, remains green.

As in most of the plants belonging to the undergrowth of the forest, the leaves are, as a rule, large, flat, thin and discolorous. In the majority of the species belonging to the subgenus *Eu-streblosa* (*Str. tortilis, Str. myriocarpa, Str. maxima, Str. Johannis-Winkleri, Str. bullata, Str. bracteolata, Str. anambasica, Str. polyantha,* and to some extent in *Str. deliensis* and *Str. scabridula*) the underside of the leaves is covered with greyish scales, which under the microscope prove to be dome-shaped excrescences crowned by a stoma, an arrangement which apparently is not uncommon in shade plants. Taxonomically of more importance is the structure of the epidermis on the upper side. As in *Psychotria* the latter consists of straight-walled cells, but in the midst of these some much smaller ones are found which are produced above the common surface into lenticular or conical excrescences (fig. 1). The latter are often difficult to detect with the naked eye, but appear to be present in all species. In the other genera of the Psychotrieae I have looked, so far, in vain for them. Far more conspicuous are the reddish or black dots with which the upper side of the leaves of *Str. tortilis*, *Str. microcarpa*, *Str. polyantha*, and probably those of *Str. multiglandulosa*, which I could not investigate myself, are marked. These dots are caused by the presence of a dark-coloured resin in some of the epidermis cells. As a rule they are in these species a very conspicuous feature, but as a differential character they are of little value, for their development varies considerably, even in leaves of the same specimen; in some instances the cells contain little or no resin, and as the cells themselves are indistinguishable from the rest of the epidermis cells in shape and size, microscopical investigation too is in such cases of no avail. Of *Str. tortilis* and *Str. microcarpa* I have seen specimens in which the dots appeared to be completely absent.

Resin may also be present in some of the cells of the mesophyll and in the mesocarp of the fruit, and even in other parts of the plant, for instance in the cortex and in the secondary bast of the shoots; in the latter these

cells are arranged in short longitudinal rows. Their number varies considerably, and they are not always easy to detect, but it is almost certain that they are nowhere completely absent. One of the most suitable places to look for them, is the connective. In the species 1–6 they are a conspicuous feature of the secondary bast. When they are present in the mesophyll, the leaves are, as a rule, more or less distinctly marbled. It is noteworthy that such marbled leaves occur also in some related plants, e.g. in the Madagascar species of *Psychotria*.

Raphide-cells are in some species a conspicuous feature, whereas in others they are difficult to detect. This depends apparently on the consistency of the leaves, for microscopical investigation reveals that they are nowhere absent. As a matter of fact, they are a general feature of the whole tribe, and are also found in some of the latter's allies, for instance in the Hedyotideae, whereas they are constantly absent in the Ixoreae and their allies, which, as I have pointed out in my "Monograph of the genus

FIG. 1. Epidermis of the upper side of the leaf of *Streblosa myriocarpa* Merr.

Pavetta" (in Fedde's Repert. 37: 11, 12. 1934), form another circle of affinity.

The nervation of the leaves is very uniform; the meshes formed by the lateral nerves and the venules are large and more or less irregular in outline. Acaridomatia are always absent.

The stipules are always interpetiolar and produced into two lobes, but they vary considerably in size and shape. In the species belonging to the subgenus *Eu-streblosa* they are much larger than in the subgenus *Para-streblosa*, and in the first-named subgenus the basal part is stronger developed than the lobes, whereas in the species belonging to the latter the lobes are better developed than the basal part; in *Eu-streblosa* they are moreover more or less persistently ciliate or ciliolate, whereas in *Para-streblosa* they are eciliate. In part of the species belonging to the latter the basal part shows a prominent midrib which runs down to the preceding node. In these species, which form the series *Costatae*, the lobes are moreover contiguous, whereas in the two other species, which are brought together in the series *Ecostatae*, the midrib is invisible and the internodes accordingly ecostate, and the lobes are separated from each other by a wide gap. Costate stipules are found also in some of the species belonging to the subgenus *Eu-streblosa*, but only in one of them, *Str. Johannes-Winkleri* Merr., the rib runs down along the stem. In the other species all the nerves arise from the angles of the stipule and converge towards the top of the undivided part, where they enter the lobes. As in many other genera belonging to this family, a fairly large number of colleters is found in the axils of the stipules. They are in this genus rather large.

The inflorescences are always of terminal origin, but by the development of a branch from the axil of one of the leaves at their base, they are, as stated above, soon pushed aside. They are, as a rule, shortly pedunculate, but in *Str. tortilis* the peduncle is about as long as the petiole of the leaf at its base, and in *Str. longiscapa* it is even about as long as the whole leaf. In these two species the peduncles are moreover erect, whereas they are in the other species of the subgenus *Eu-streblosa* recurved, and in those belonging to *Para-streblosa* patent.

The inflorescences themselves show various degrees of complexity. The simplest form is that found in *Str. bracteolata* Merr.: it consists of a single axis bearing at each node a sterile bract and a pair of flowers, one provided with a bract and the other ebracteate. The ebracteate flower might be regarded as a superposed one, and the whole inflorescence as a raceme, but it seems more plausible to regard the ebracteate flower as a terminal one, and the bracteate flower as representing one of the branchlets of a dichasium, the other branchlet forming the continuation of the axis (fig. 2). This interpretation is supported by two weighty arguments: (1) the ultimate ramifications of the inflorescences of the Psychotrieae are everywhere of the dichasial type, and there is therefore every reason to assume that those of *Streblosa* will be of the same or at least of a

related kind; (*2*) in almost all the other species of *Streblosa* the branchlets are at least partly arranged in pairs with a single flower in the fork between them, which means that they themselves are parts of a dichasium, and it is a well-known fact that the branchlets of a dichasium often develop into monochasia, whereas there are no fully authorized examples of dichasia developing into racemes or spikes. The flower-pairs are arranged in such a way that a line connecting the successive pairs would twine round the axis like the shoot of a winding plant. The arrangement of the flower-pairs, therefore, is cincinnate. The inflorescence, however, is not a simple cincinnus, for in a cincinnus we find but one flower at each node. For the same reason it is not exactly a monochasium, although we will use this term here for the sake of convenience, but more or less intermediate between the latter and the dichasium.

In *Str. bullata* Merr. the inflorescence is twice dichasially branched with rather long-pedicellate flowers in the forks, but after the second bifurcation

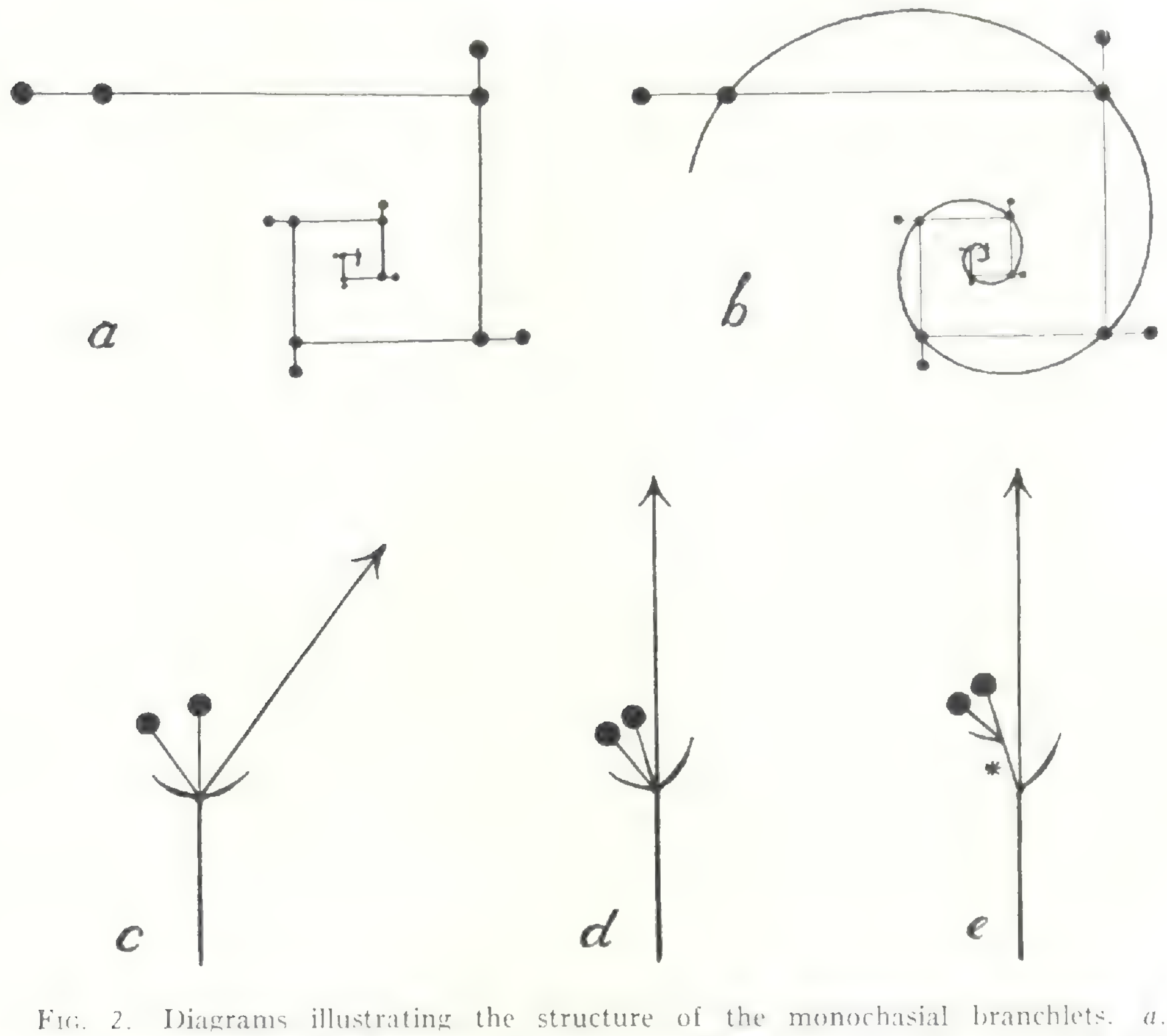

FIG. 2. Diagrams illustrating the structure of the monochasial branchlets. *a*. vertical projection; *b*. the same, but the terminal flowers connected by a spiral line representing the axis; this figure shows perhaps better than *a* why the lateral flowers do not stand before the terminal ones, but more or less beside them; *c*. the lateral shoot which is to form the continuation of the inflorescence axis in the position which theoretically it ought to have; *d*. the condition found in *Para-streblosa;* *e*. the condition found in *Eu-streblosa;* at * the "interbracteal" node.

the branchlets develop in the same way as the inflorescence of *Str. bracteolata*.

In the other species we find three or five subumbellately or, rarely, racemosely arranged branchlets, of which the lowest pair are sometimes in their turn provided with a pair of lateral branchlets; the main branchlets as well as those of the second order may be once dichasially ramified, but the prongs of these dichasia, or the branchlets themselves if they are unforked, are monochasial.

The monochasial structure of at least a part of the inflorescence, is a character of great taxonomic importance, for this arrangement is found nowhere else in the Psychotrieae.

It is in cymous inflorescences always somewhat difficult to make out how the terms bract, bracteole and pedicel should be used, but if we stick to the principle that the bud in the axil of a bracteole remains rudimentary, we may find a way out of the difficulty, for in this case the only hypsophylls to which the name could be applied, would be the ultimate ones in whose axils the flowers remain rudimentary, but as these hypsophylls are indubitably homologous with the other ones, there is obviously no reason to give them another name: in the cymous inflorescences there are therefore no bracteoles. When this is conceded, the determination of what should be called pedicel, offers no difficulty: in a dichasium it is obviously the axis which begins at the insertion of the dichasial prongs or at the insertion of the bracts in whose axils the latter develop. In a monochasium the base of the pedicel is accordingly recognizable at the insertion of the bract or of the bract-pair. In *Streblosa* the matter is somewhat complicated by the circumstance that the two bracts which one would expect to find at the same height, are in reality often inserted at different heights. This means that between the two of them an extra internode has developed, which we will call the interbracteal internode. The shoot which forms the continuation of the axis of the monochasium develops always from the lower bract, which, as a rule, is somewhat larger than the other one, in whose axil the lateral flower develops. In the subgenus *Eu-streblosa* the interbracteal internode is always easily recognizable, whereas in *Para-streblosa* it is either absent or indistinct. In *Para-streblosa* the flowers, moreover, are always subsessile, whereas in *Eu-streblosa* subsessile flowers are met with in *Str. tortilis* and in *Str. microcarpa* only; in the other species they are distinctly pedicellate. Because of the presence of the interbracteate internode the flower-pairs of *Eu-streblosa* give one the impression of being stipitate, and for the sake of convenience, this term has been used in the descriptions of the various species.

The flowers are always 5-merous and heterostylous. It is true that those of *Str. urticina* were described by Stapf as 4-merous, but this is a mistake: in the drawings on the plate accompanying his description they are correctly shown as 5-merous. They are as a rule very small. The largest ones which I could investigate, are those of *Str. bracteolata*, which reach a length of 9 mm.; in several other species they vary between 2.5

and 3.5 mm. Heterostyly is very often met with in the Psychotrieae and their allies; it occurs, for instance, also in the Hedyotideae. It is, however, no general feature of these tribes. The ovary is always bilocular and, as everywhere else in the Psychotrieae, each cell contains a single ovule ascending from the angle between the bottom of the cell and the septum.

The calyx consists of a short tube and five usually short, broadly triangular, ovate-triangular or suborbicular, rarely somewhat longer and then oblong, lobes, alternating with baculiform glands. The latter are like the previously mentioned raphides and the tendency to heterostyly a general feature of the Psychotrieae and of some of the related tribes, e.g. of the Hedyotideae. The aestivation of the calyx-lobes is usually more or less open or subvalvate; the large calyx-lobes of *Str. chlamydantha* Brem., however, are distinctly imbricate.

The corolla is always white, and consists of a short cylindrical or, in the upper half, above the insertion of the stamens, slightly widened tube and five spreading lobes, valvate in the bud. In the middle or somewhat above the middle the tube is provided with fairly long hairs. In *Eu-streblosa* the latter form a complete ring, whereas in *Para-streblosa* they are arranged in five bundles alternating with the stamens.

The stamens are inserted at the same height as the hairs. In the long-styled flower they are more or less included, and in the short-styled one exserted. The filaments are always glabrous, and the anthers oblong and dorsifixed. The pollen grains are small, globose, 3-porous and minutely reticulated.

The disk is, as a rule, fairly large, semi-globose or annular, and glabrous. At the top it shows a transverse impression corresponding in position with the septum in the ovary.

The style is thin and glabrous, and ends in two filiform or narrowly linear stigma-lobes. In the short-styled flower it is included, and the stigma-lobes are but slightly spreading, whereas in the long-styled flower it is exserted, and the stigma-lobes are more distinctly spreading and at the top sometimes recurved.

The fruits are very small, smaller, in fact, than anywhere else in this tribe, and in size and shape more like those of *Hedyotis*, *Lerchea* or *Xanthophytum* than like the drupes of the other Psychotrieae. They are either globose or, more often, didymous, crowned by the persistent calyx and the somewhat shrunken disk, and they remain always green. When fully ripe, they split into two drupaceous mericarps, which in the herbarium are distinctly costate, but in the fresh condition smooth. The mesocarp is but weakly developed, and the endocarp too is thin. The pyrenes vary in colour between yellowish, red and almost black, and they are usually 5-ribbed, three of the ribs ornamenting the convex side, and the two others marking the border of the latter; the flat inner side shows in the centre an excavation, which a more or less distinct keel divides into two parallel or upwards somewhat divergent hollows. The keels may be

acute or obtuse, and the excavation on the flat side varies in the various species somewhat in size and shape, but the differences are difficult to describe, and they are therefore not mentioned in the descriptions. The seed shows exactly the same sculpture as the pyrene, and consists of a thin, red or red-dotted testa and a uniform horny endosperm. The embryo is small and nearly straight, and the radicle points downwards.

The shape and sculpture of the pyrene, and the way in which the testa surrounds and eventually penetrates the endosperm, are important diagnostics for the genera belonging to the *Psychotria* group. *Streblosa* is for instance easily distinguishable from *Mapouria* Aubl., to which the type-species was referred by Hooker in Benth. & Hook. f., Gen. Pl., by the presence of the two contiguous hollows on the ventral side of the pyrene, and from *Psychotria* L. in the delimitation in which it is taken by me (cf. Brem. in Jour. Bot. 71: 273. Oct. 1933, and in Pulle's "Flora of Suriname" 4: 261. 1934) by the absence of the median groove on the ventral side of the pyrene and the corresponding intrusion of the testa into the seed. Apart from the difference in size, the pyrenes of *Streblosa,* however, are very similar to those of *Geophila* Don; the fruits of the latter, on the other hand, are not only larger but also more fleshy, and coloured instead of green. The pyrenes of *Notopleura,* the genus which resembles *Streblosa* in habit, are dorsiventrally compressed, and their ventral side is either entirely flat or provided with a protruding ridge, but the latter does not arise from the bottom of a cavity. Of these plants too the fruits are coloured and larger and more fleshy than those of *Streblosa.*

Within the genus *Streblosa* itself two slightly different kinds of fruit are met with. In the subgenus *Eu-streblosa* and in *Str. chlamydantha* and *Str. longiscapa* the mericarps are nearly globose, and the fruits therefore didymous, but in the other species of *Para-streblosa* the mericarps are semi-globose, and the fruits accordingly globose: in herbarium material the latter are 8–ribbed, whereas the didymous fruits are either 6- or 10-ribbed. In the species which are normally provided with didymous fruits, occasionally some globose ones are found; the latter are 5-ribbed and owe their aberrant shape to the abortion of one of the mericarps.

CLASSIFICATION OF THE SPECIES[1]

The genus has here been divided into two subgenera. In *Eu-streblosa* the stipules are wider than the stem, and their basal part is more strongly developed than the lobes, the flower-pairs are distinctly stipitate, i.e. the interbracteate internode is always developed, the hairs in the corolla-tube form a complete ring, and the fruits are always didymous. In *Para-streblosa,* on the contrary, the stipules are not wider than the stem, and their lobes are better developed than the basal part, the flower-pairs are

[1] The abbreviations for the herbaria of the institutions cited in this paper are as follows: AA = Arnold Arboretum; BZ = Buitenzorg Botanic Garden; HBG = Inst. Allg. Bot., Hamburg; K = Royal Botanic Gardens, Kew; NY = New York Botanical Garden; U = Bot. Mus. Utrecht.

subsessile, i.e. the interbracteate internode is either absent or but indistinctly developed, the hairs in the corolla-tube are arranged in five bundles, and the fruits are usually globose; didymous fruits, however, are found in *Str. chlamydantha* and in *Str. longiscapa*.

A further subdivision of *Eu-streblosa* does not lead to results which are of practical value, the groups becoming too small. The first two species, *Str. tortilis* (Bl.) Khs. and *Str. microcarpa* Ridley with their subsessile flowers, are doubtless nearly related, but *Str. lampongensis* Brem., a species with distinctly pedicellate flowers, shows in the structure of its stipules with their comparatively long lobes, an unmistakable likeness with these two species. The next three species, *Str. bracteata* Ridl., *Str. myriocarpa* Merr. and *Str. maxima* Brem., form another natural group, characterized by large leaves and very large, oblong or obovate stipules. Ovate or ovate-lanceolate stipules provided with a prominulous or prominent midrib characterize a group of Bornean species, to wit *Str. Johannis-Winkleri* Merr., *Str. bullata* Merr. and *Str. bracteolata* Merr., to which the less known species *Str. multiglandulosa* Merr. and *Str. undulata* Khs. interpr. Val. probably also belong. A somewhat isolated position is occupied by *Str. anambasica* Brem.; in the small size of the flowers it resembles the Sumatran species which form the next group, but it differs conspicuously from this group by the more strongly ramified inflorescences. The five Sumatran species, *Str. deliensis* Brem., *Str. hypomalaca* Brem., *Str. leiophylla* Brem., *Str. polyantha* Khs. and *Str. scabridula* Brem., are provided with ecostate stipules, and possess inflorescences with three undivided branchlets and very small flowers.

In *Para-streblosa* two series may be distinguished: the *Costatae* with conspicuously costate stipules and bicostate internodes, and the *Ecostatae* with ecostate stipules and smooth internodes; in the first series the stipular lobes are contiguous, whereas in the second they are separated from each other by a wide gap. The first are confined to Borneo, whereas the second group is found in Palawan and other islands of the Philippines. The latter comprises at present but two species, one consisting of two, and the other of three varieties, but it is not impossible that further study will show that these varieties are sufficiently distinct to be regarded as species. Among the *Costatae*, *Str. chlamydantha* Brem. and *Str. longiscapa* Brem. occupy a more or less isolated position. They are provided with didymous fruits, and their calyx-lobes are larger than in the other species.

KEY TO THE SPECIES

a. The undivided part of the stipules wider than the stem and at least 2 mm. high, but, as a rule, much higher. Hairs in the corolla-tube in a complete ring. Fruits always didymous. — Species from the Malay Peninsula, Sumatra, Java and Borneo.

Eu-streblosa

b. Stipules with an ovate base and two slightly spreading lobes, which are longer than the base. Flowers either sessile or pedicellate, but the pedicels never more than 0.6 mm. long.

c. One of the flowers of each pair sessile; the pedicel of the other one not more than 0.3 mm. long (pedicels of the flowers in the forks of the dichasia somewhat longer).
d. Leaves ovate or ovate-elliptic, less than twice as long as wide, and rarely more than 10 cm. long; on the underside lepidote. Peduncle about as long as the petiole of the preceding leaf. The larger floral bracts about 1 mm. long. — Java and West Sumatra.....1. *Str. tortilis.*
d: Leaves lanceolate- or oblong-elliptic, more than twice as long as wide, and nearly always more than 10 cm. long; not lepidote on the underside. Peduncle much shorter than the petiole of the preceding leaf. The larger floral bracts at least 1.2 mm. long. — Malay Peninsula and Sumatra.....2. *Str. microcarpa.*
c: All flowers distinctly pedicellate; the pedicels about 0.6 mm. long. — South Sumatra.....3. *Str. lampongensis.*
b: Stipules ovate, obovate or oblong in outline; the incision between the two lobes not reaching beyond the centre. Flowers always pedicellate, and the pedicels always more than 0.6 mm. long.
e. Leaves at least 15 cm. long. Stipules oblong or obovate. — Bornean species.
f. Stem glabrous. Leaves slightly pubescent on the midrib beaneath. — West Borneo.....4. *Str. bracteata.*
f: Stem densely rufous-pubescent. Leaves on the underside on midrib, nerves and venules densely pubescent.
g. Petioles 1–2 cm. long; blade 15–26 cm. × 7–13 cm., subobtuse, provided with about 20 pairs of nerves. Midrib of the stipules indistinct. — West Borneo.....5. *Str. myriocarpa.*
g: Petioles 2–8 cm. long; blade 25–30 cm. × 11–12 cm., caudate-acuminate, provided with 11–15 pairs of nerves. Midrib of the stipules prominent and pilose. — North Borneo.....6. *Str. maxima.*
e: Leaves less than 15 cm. long. Stipules ovate or ovate-lanceolate.
h. Stipules provided with a prominulous or prominent midrib. — Bornean species.
i. Leaves on the upper side dotted with bulging resin cells. — North Borneo.....7. *Str. multiglandulosa.*
i: Leaves not dotted with resin cells.
j. Leaves lanceolate, all or at least the majority more than 12 cm. long.
k. Internodes distinctly bicostate. Leaves with about 9 pairs of nerves; on the underside very sparsely pubescent. Stipules ovate, 7–9 mm. wide. — West Borneo.....8. *Str. Johannis-Winkleri.*
k: Internodes ecostate. Leaves with about 12 pairs of nerves; on the underside, especially on the nerves, sparsely villosulous. Stipules ovate-lanceolate, 6 mm. wide. — South-east Borneo.....9. *Str. undulata.*
j: Leaves relatively wider and less than 12 cm. long.
l. Inflorescence twice dichasially ramified. Leaves obtuse or subobtuse and conspicuously bullate. — West Borneo.....10. *Str. bullata.*
l: Inflorescence unbranched. Leaves shortly acuminate, plane. — West Borneo.....11. *Str. bracteolata.*
h: Stipules not provided with a distinct midrib. — Species from the Anambas Islands and Sumatra.
m. Inflorescence with five main branchlets; the lower pair once forked; in the fruiting stage increasing to about twice the original size. — Anambas Islands.....12. *Str. anambasica.*
m: Inflorescence with three branchlets; all branchlets simple; in the fruiting stage not conspicuously larger than before. — Sumatran species.
n. Stipules ovate-lanceolate, divided nearly to the middle. — East Sumatra.....13. *Str. deliensis.*

n: Stipules ovate-orbicular, divided for not more than one-third.
o. Stipules less than 5 mm. wide. None of the petioles more than 2 cm. long. — Mentawei Islands.....14. *Str. hypomalaca.*
o: Stipules more than 10 mm. wide. The lower petioles more than 2 cm. long.
p. Stems and leaves completely glabrous. — Mentawei Islands. .....15. *Str. leiophylla.*
p: Stems and both sides of the leaves villous or hirsute.
q. Leaves on the upper side dotted with bulging and in herbarium material blackened resin cells, and on both sides sparsely villous, provided with 9–10 nerve pairs. Pyrenes black. — West Sumatra.....16. *Str. polyantha.*
q: Leaves not dotted with resin cells, on both sides scabridly hirsute, provided with 12–13 pairs of nerves. Pyrenes red. — East Sumatra.....17. *Str. scabridula.*

a: The undivided part of the stipules of the same width as the stem and less than 2 mm. high. Hairs in the corolla-tube in bundles. Fruits either didymous or globose. — Species from Borneo and the Philippines.

Para-streblosa

r. Stipules costate and the lobes contiguous. Internodes bicostate. — Bornean species.

Costatae

s. Bracts obovate, longer than the flowers. Calyx 1.2 mm. high; lobes ovate-oblong, very unequal in size, imbricate. — East Borneo..... .....18. *Str. chlamydantha.*
s: Bracts ovate, lanceolate or linear, shorter than the flowers. Calyx at the most 0.8 mm. high; lobes ovate or triangular, equal, never overlapping.
t. Peduncle as long as or nearly as long as the preceding leaf. Calyx divided nearly to the base; lobes ovate, 0.6 mm. long. Fruits didymous. — East Borneo.....19. *Str. longiscapa.*
t: Peduncle much shorter than the preceding leaf. Calyx-lobes triangular, not more than 0.4 mm. long. Fruits globose.
u. Leaves linear-lanceolate, lanceolate or lanceolate-oblong; raphides at the underside in herbarium material easily distinguishable. Bracts early deciduous.
v. Leaves linear-lanceolate, 10–16 cm. × 2.0–3.3 cm. Peduncle not more than 4 mm. long. — West Borneo.....20. *Str. lanceolata.*
v: Leaves lanceolate or lanceolate-oblong, 11–16 cm. × 4–6 cm. Peduncle 1.2–1.5 cm. long. — North Borneo.....21. *Str. urticina.*
α. Stem, petioles and, in young leaves, midrib and nerves puberulous; peduncle densely puberulous. — North Borneo.....var. *Stapfii.*
α: All parts glabrous. — North Borneo.....var. *glabrescens.*
u: Leaves elliptic; raphides never easily distinguishable. Bracts subpersistent.
w. Basal part of the stem about 3 mm. thick. Leaves 14–17 cm. × 8–10 cm., with about 10 pairs of nerves. Corolla 3.2 mm. long. — North and East Borneo.....22. *Str. glabra.*
w: Basal part of the stem about 7 mm. thick. Leaves 17–27 cm. × 8.5–12 cm., with about 13 pairs of nerves. Corolla 6 mm. long. — West Borneo.....23. *Str. assimilis.*

r: Stipules ecostate and the lobes separated from each other by a wide gap. Internodes ecostate. — Species from Palawan and the other Philippines.

Ecostatae

x. Internodes without grooves. Stipular lobes linear, 1.5–1.8 mm. long; the gap rectangular. Corolla 3.5 mm. long. — Palawan.....24. *Str. palawanensis.*

β. Leaves in herbarium material olivaceous, on the upper side nitidulous; raphides on the underside here and there visible. — Palawan.....
.....var. *Merrillii*.

β: Leaves in herbarium material brown, on both sides dull; raphides nowhere distinguishable. — Palawan.....var. *Elmeri*.

x: Internodes with two longitudinal grooves. Stipular lobes semi-triangular, 6–7 mm. long and at the base 3 mm. wide; the gap with rounded corners. Corolla 2 mm. long. — Luzon, Catanduanes and ?Samar.....
.....25. *Str. axilliflora*.

γ. Inflorescences even in the fruiting stage not more than 1.5 cm. in diam.

δ. Leaves lanceolate-elliptic, 10–14 cm. × 4.2–5.4 cm. — Luzon.....
.....var. *angustifolia*.

δ: Leaves elliptic, 8 cm. × 5.5 cm. — Luzon.....var. *latifolia*.

γ: Inflorescences in the fruiting stage up to 3.5 cm. in diam. — Catanduanes.
.....var. *laxiflora*.

Subgenus **Eu-streblosa**

Stipulae magnae; pars basalis caule latior. Bracteae cuiusque paris diversa altitudine insertae. Corollae tubus intus annulo completo pilorum instructus. Fructus semper didymus. — Species 1–17, in Peninsula Malayana, Sumatra, Java et terra Borneënsi endemicae.

1. **Streblosa tortilis** (Bl.) Khs. in Ned. Kruidk. Arch. 2 (2): 246. 1851, var. β excl.; Miq. in Ann. Mus. Bot. Lugd.-Bat. 4: 211. 1869; Val. in Ic. Bog. 4: 139, t. 343. 1912; Koorders-Schuhmacher, Syst. Verz. 1 (1): 105. 1912.

Psychotria tortilis Bl., Bijdr. Fl. Ned. Ind. 958. 1826; Miq., Fl. Ind. Bat. 2: 294. 1857, Suppl. 223. 1860; Hook. f. in Benth. & Hook. f., Gen. Pl. 2: 124, 125. 1873, syn.

Psychotria microcarpa Wall. excl.; Boerl., Handl. Fl. Ned. Ind. 2 (1): 139. 1891; Koorders, Exkursionsfl. Java 3: 268. 1912. Non Hook. f., Fl. Brit. Ind. 3: 169. 1880, nec King & Gamble in Jour. As. Soc. Beng. 72 (2): 11. 1906; nec Ridl. in Jour. As. Soc. Straits 57: 62. 1911, quae est *Str. microcarpa* Ridl.

Caulis ascendens, 10–20 cm. altus, ad apicem 2–2.5 mm. diam., basi plerumque usque ad 3 mm. incrassatus, primum pilis rufis puberulo-pubescens, deinde glabrescens, internodiis primum bisulcatis, deinde teres, cortice rubro-striatulo vestitus, basin versus lignescens et ibi libero crassiore rubro-striatulo munitus; pars decumbens radicans. Folia petiolo supra glabro et subtus puberulo-pubescente, plerumque conspicue rubro-striatulo, 1–3.5 cm. longo instructa; lamina ovata vel ovato-elliptica, 3.5–11 cm. longa et 2.5–7.2 cm. lata, apice acuta vel subacuta, basin versus rotundata, prope petiolum tamen subito contracta, opaca, supra primum dense scabridula, mox glabrescente et plerumque cellulis resiniferis rubris, sicc. nigrescentibus dense punctata, sicc. saturate brunnea vel badia, subtus costa nervis venulis primum pilis rufis dense puberulo-pubescens, deinde parcius substrigosa, inter venulas albido-lepidota, sicc. dilute brunnea vel albida, raphidibus distincte lineolata, costa subtus plerumque distincte rubro-striatula, mesophyllo plerumque cellulis resiniferis marmorato, nervis utroque latere costae 8 vel 9 utrimque prominulis, venulis utrimque distinguendis. Stipulae e basi ovata, 5–8 mm. lata in lobos duos angustos et acutissime exeuntes, plus minusve divergentes, 3–5 mm. longos contractae, ad basin pubescentes et margine fugaciter ciliolatae, ceterum glabrae. Inflorescentiae pedunculo erecto, petiolo folii praecedentis subaequilongo, gracili, pubescente instructae; ramuli 5 subumbellati,

primum breves, post anthesin usque ad 3 cm. elongati, plerumque semel dichasiales, pubescentes. Bracteae ramulorum triangulares, 3–5 mm. longae, rubro-striatulae, margine ciliatae, subliberae; bracteae florales inaequales, cuiusque paris inferior late ovata, 1 mm. longa, superior angustior, 0.8 mm. longa, ceterum ut bracteae ramulorum. Flores furcis dichasiorum inserti pedicello 0.6 mm. longo instructi; aliorum pedicelli 0.1 mm. longi; florum pares stipite 0.2–0.3 mm. longo elati. Calyx 1 mm. altus, lobis ovato-triangularibus tubo duplo longioribus, rubro-striatulis. Corolla 3.7 mm. longa, tubo dimidio superiore subcampanulato. Fructus rubro-maculatus, primum pubescens, deinde glabrescens; pyrenae rubro-brunneae.

Habitat silvas Javae praesertim partis occidentalis et Sumatrae Occidentalis.

JAVA: Bantam Res.: Nando Badak, *Blume s.n.* (L), f. longistyla, et G. Seribu, *Blume 893* (L), f. brevistyla (in eodem folio fixae), TYPI, dupl. U. Buitenzorg Res.: G. Djambu near Leweliang, alt. 250 m., *Bakhuizen v. d. Brink 5248* (BZ, L); ibidem, *Bakhuizen v. d. Brink Jr. 855* (U); G. Tjibodas near Tjampea, alt. 200 m., *Hallier 461* (BZ, L); G. Burung (G. Bunder), alt. 200–300 m., *Schiffner 2709* (L); Pasir Ipis near G. Parungpung, alt. 750 m., *Bakhuizen v. d. Brink 7293* (BZ, L).

SUMATRA: Galangankwo near Ginteng, *Korthals s.n.* (L): leaves somewhat smaller than in the type (5.5–7 cm. × 3–4.3 cm.), but otherwise apparently not different.

The exact locality of the plant collected by Korthals in Sumatra, is unknown to me: that quoted above, is the one given by Korthals in his paper in Ned. Kruidk. Arch. 2 (2): 246, but a label attached to the specimen in the Leiden herbarium and written by Korthals himself, is inscribed: P. Genting.

A specimen collected by Koorders in Banjumas (Central Java), has leaves which are much larger than those of the type (up to 14.5 cm. × 9 cm.), and are not dotted with resin cells, but are like those of the type provided with 8 or 9 pairs of nerves. The position of this specimen is somewhat uncertain: provisionally I refer it to the species described above, but more material from the same region will have to be investigated before a definite conclusion can be drawn. Koorders-Schuhmacher l.c. quotes a specimen (*Koorders 23565* BZ) collected in the Malang Residency at Sumber Tangkil. It remains to be seen whether this really is conspecific.

In some of the specimens, e.g. in *Blume 893*, anomalous inflorescences are seen in which the branchlets are replaced by somewhat impoverished, but otherwise normal inflorescences.

The roots on the decumbent part of the stem are not confined to the nodes, but spread over the whole length of the internodes. *Schiffner 2709* shows young plants springing from the decumbent part: one of them is already rooting at the base.

Streblosa tortilis comes very near to *Str. microcarpa*, with which it was confused by Hooker ll.cc. In the shape of the stipules and in the structure of the inflorescence with its five forked branchlets and subsessile flowers and in the usually conspicuously dotted upper side of the leaves there is a close resemblance, but *Str. tortilis* is a much smaller plant, the stem

rarely exceeding 20 cm. in height and the leaves rarely 10 cm. in length; the leaves, moreover, are ovate or ovate-elliptic and acute or subacute instead of elliptic and more or less distinctly acuminate, and they are lepidote on the lower side, and the peduncle is erect and about as long as the petiole of the leaf at its base, instead of much shorter and recurved. With *Str. lampongensis* too it shows an unmistakable affinity, for instance in the shape of the stipules and in the development of a rather thick secondary bast streaked with red resin cells in the basal part of the stem, but this species has distinctly pedicellate flowers and its leaves are not dotted with resin cells on the upper side. Groups of resin cells in the secondary bast are not confined to these three species, but are found also in *Str. myriocarpa* and in *Str. maxima*, and perhaps in the related species *Str. bracteata* and *Str. multiglandulosa*, but of these I had no material at my disposition, and the original descriptions make no mention of this character. An epidermis dotted with resin cells on the upper side of the leaves, is a much less common feature than the presence of resin cells in the cortex and in the secondary bast. In this respect *Str. tortilis* is matched only by *Str. microcarpa* and probably by *Str. multiglandulosa*, and further by the but distantly related *Str. polyantha*. These resin cells are not always easily distinguishable, probably because the production of resin varies according to circumstances, and as the cells, in which the resin is deposited, are in shape and size indistinguishable from the ordinary epidermis cells, it is easily conceivable that they are not always conspicuous.

2. **Streblosa microcarpa** Ridl., Fl. Mal. Pen. 2: 148. 1923. Non Ridl. in Kew Bull. 1926: 70. 1926, quae est *Str. leiophylla* Brem.

Streblosa Wallichii Merr. in Papers Mich. Acad. Sci. 23: 194. 1938, n. nom. illeg.

Psychotria tortilis Bl. in errore apud Hook. f., Fl. Brit. Ind. 3: 169. 1880; King & Gamble in Jour. As. Soc. Beng. 72 (2): 11. 1906; Ridl. in Jour. As. Soc. Straits 57: 62. 1911.

Streblosa puberula Merr. in Papers Mich. Acad. Sci. 23: 195. 1938.

Caulis ascendens, 20–60 cm. altus, ad apicem 1.5–2 mm. diam., basi usque ad 5 mm. accrescens, internodiis primum bisulcatis, deinde teres, cortice rubro-striatulo vestitus, basin versus lignescens et ibi libero crassiore rubro-striatulo munitus. Folia petiolo supra glabro, subtus primum densius, deinde sparsius puberulo-pubescente, 1.5–5 cm. longo instructa; lamina elliptica, 10–23 cm. longa et 4.5–9.5 cm. lata, apice acuta vel acuminata, basi contracta, supra nitidula, primum minute scabridulo-papillosa, deinde glabrescens, plerumque cellulis resiniferis rubris, sicc. nigrescentibus dense punctata, sicc. olivaceo-brunnea, subtus praesertim costa nervis venulis primum pilis rufis dense puberulo-pubescens, deinde sparsius pubescens et inter venulas glabrescens, haud lepidota, sicc. pallide viridis vel interdum dilute rubro-brunnea, raphidibus inconspicuis, nervis utroque latere costae 10–15, venulis utrimque distinguendis. Stipulae e basi ovata 4–6 mm. lata in lobos duos angustos et acutissime exeuntes, plus minusve divergentes, 3.5–7 mm. longos contractae, margine scabridulae, ceterum glabrae. Inflorescentiae pedunculo recurvato, puberulo-pubescente, 4–5 mm. vel raro usque ad 10 mm. longo instructae; ramuli 5 subumbellati, primum breves, post anthesin usque ad 1.5 cm. elongati,

pubescentes, infimi iterum ramulis duobus lateralibus instructi, alii semel dichasiales. Bracteae ramulorum triangulares, 3–5 mm. longae, rubro-striatulae, margine ciliatae, basi late connatae; bracteae florales inaequales, cuiusque paris inferior 1.5–2.5 mm., superior 1.2–1.7 mm. longa, ceterum ut bracteae ramulorum. Flores furcis dichasiorum inserti distincte pedicellati, alii subsessiles; florum pares stipite 0.1–0.3 mm. longo elati. Calyx 0.7–1 mm. altus, lobis ovato-orbicularibus tubo fere duplo longioribus, rubro-striatulis. Corolla 2.4–3 mm. longa, tubo dimidio superiore subcampanulato. Fructus plerumque rubro-maculatus, primum pubescens, deinde glabrescens; pyrenae rubrae vel nigrescentes.

Habitat Peninsulam Malayanam et Sumatram.

MALAY PENINSULA. Penang, *Wallich* Herb. no. *8344*, TYPUS (exemplum vidi in Herb. Gray.); Perak (cf. Ridl. ll.cc.).

SUMATRA. Djambi Res.: S. Mengopih, *Rutten-Kooistra 3* (U) "very common." East Coast Govt.: Asahan, Silo Maradja, alt. 40–60 m., *Bartlett 8686* (NY). H. Bagasan, *Rahmat 6429* et *6543* (AA). Tapianuli Res.: Padang si Dimpuan, alt. 30–250 m., H. Imbaru, *Rahmat 4636* (NY); Aek Roppak, *Rahmat 4675*, *4775* (NY); Si Harehare Djae, *Rahmat 5000* (NY, TYPE of *Str. puberula* Merr., AA); Sopsopan an Aek si Olip, *Rahmat 5101* (NY). Govt. Atjeh and Dependencies: Country of the Gajo, between Aer Panas and Reoma Bundar, near milestone 66/67, alt. 1000 m., *v. Steenis 10070* (BZ). West Coast Res.: G. Malintang, N.W. slope, alt. 1150 m., *Bünnemeyer 3529* (BZ).

The specimens collected by *Bünnemeyer* on the G. Malintang in West Sumatra, differ from the type in the absence of the dots caused by the resin cells in the epidermis of the leaves, the slightly longer peduncles (up to 10 mm. long), the nearly estipitate flower-pairs, the slightly larger size of the flowers and the nearly black pyrenes. The material is, owing to the development of mould during the process of drying, in a very bad condition.

King & Gamble l.c., cite under their *Psychotria tortilis* a specimen collected in South Sumatra by *Forbes (1495)*, which I have not seen, and whose position, therefore, remains uncertain: it may have belonged to the real *Streblosa tortilis* or to *Str. lampongensis*.

Merrill, l.c., rejected Ridley's name for this species because the specific epithet was adopted from *Psychotria microcarpa* Wall., which he regards as an illegitimate name because there exists an earlier homonym. In reality, however, it is a manuscript name, which means that it is to be regarded as non-existent. As the plant, therefore, had no legitimate name, Ridley was free to choose whatever name he wished.

The differences between *Str. microcarpa* and *Str. tortilis* have been given above. In general aspect it is perhaps more like *Str. lampongensis*, which it resembles in height and in the shape and size of the leaves, but from which it is easily distinguishable by the subsessile flowers.

3. **Streblosa lampongensis** Brem. n. spec.; TYPUS: *Ibut 29* (L).

Caulis probabiliter circ. 40 cm. altus, sed pars basalis speciminum investigatorum non conservata et habitus inde non bene notus; interdum pseudo-dichotome furcatus; ad apicem 1.5 mm. diam., basi usque ad 5 mm. incrassatus, internodiis primum bisulcatis, sicc. longitudinaliter

rugosis, deinde teres, cortice fusco, rubro-striatulo vestitus, basin versus lignescens et ibi libero crassiore sed haud rubro-striatulo munitus. Folia petiolo subtus primum pilis rubris puberulo, mox glabrescente, 1.5–5 cm. longo instructa; lamina foliorum superiorum ovato-elliptica, 10–16 cm. longa et 5.5–9.5 cm. lata, apice acuta vel subacuminata, basi rotundata sed prope petiolum subito contracta, foliorum inferiorum lanceolato-oblonga, 13–15 cm. longa et 5–5.5 cm. lata, apice basique attenuata, omnium supra nitidula vel opaca, sicc. supra saturate et subtus dilute rubro-brunnea, primum subtus costa nervisque pilis rubris crispatis dense puberulo-pubescens, deinde plus minusve glabrescens, haud lepidota, raphidibus inconspicuis, nervis utroque latere costae 11–14, venulis utrimque distinguendis. Stipulae e basi ovata, 5–6 mm. lata in lobos duos angustos et acutissime exeuntes, plus minusve divergentes, 4 mm. longos contractae. Inflorescentiae pedunculo recurvato, sparse hirtello, 5–8 mm. longo instructae; ramuli 5 subumbellati, infimi iterum ramulis duobus lateralibus instructi et postea ut ramuli alii semel dichasiales, sparse hirtelli, primum breves, post anthesin usque ad 2 cm. elongati. Bracteae ramulorum triangulares, uno latere lobo stipulari triangulari instructae, 4–5 mm. longae, costa carinatae, subglabrae; bracteae florales ovatae, inaequales, cuiusque paris inferior 1.5 mm. longa, superior minor, hirtellae. Florum pares stipite sparse hirtello 0.6 mm. longo elati; flores pedicellati; pedicelli sparse hirtelli, 0.5–0.6 mm. longi. Calyx 0.7 mm. altus, lobis ovato-triangularibus tubo aequilongis. Corolla 2.2 mm. longa, tubo dimidio superiore subcampanulato. Fructus subglaber; pyrenae rubrae.

Habitat Sumatram Australem.

SUMATRA. Lampong Districts: slope of G. Rate Telanggaran, alt. 400 m., *Ibut 29* (L, TYPUS), (U, dupl. typi).

It is not impossible that *Forbes 1495*, which was collected in the same region, will prove to belong to this species. As stated above, it was referred by King & Gamble to their *Psychotria tortilis*.

A noteworthy feature of the specimens described above is that they are partly pseudo-dichotomously forked. This means that in this species occasionally both the axillary buds at the base of the peduncle develop into a shoot. The same phenomenon has been observed in *Str. chlamydantha* and in *Str. longiscapa*.

Streblosa lampongensis resembles the two preceding species in the shape of the stipules, the thick layer of secondary bast and the five main branchlets of the inflorescence, but it differs conspicuously from them in its distinctly pedicellate flowers. In this respect it resembles the following species, in which the pedicels, however, are much longer and the bracts much larger, and whose stipules are provided with a larger undivided part and shorter, not diverging lobes.

4. **Streblosa bracteata** Ridl. in Jour. As. Soc. Straits 57: 64. 1911.

Caulis plus quam 45 cm. altus, glaber, basin versus lignescens et ibi usque ad 6 mm. incrassatus. Folia petiolo 2.5–3.2 cm. longo instructa; lamina ovato-lanceolata, 15–17.5 cm. longa et circ. 10 cm. lata, apice subacuta, basi contracta, supra glabra, subtus costa pilis crispatis parce pubescens, nervis utroque latere costae 20. Stipulae magnae ambitu oblongae, bifidae, lobis acuminatis 12 mm. longis, glabrae. Inflorescentiae

pedunculo 12 mm. longo, pilis crispatis pubescente instructae; ramuli pauci. Bracteae florales oblongae, obtusae, glabrae, flore longiores. Flores pedicellati; pedicelli flore longiores, pubescentes. Calyx lobis breviter ovatis. Corolla nondum nota. Fructus glaber.

Habitat terrae Borneënsis partem occidentalem.

BORNEO. Sarawak, Jambusan, *Ridley 12437* n.v.; Bau, *Ridley 11741* n.v.

The description given above has been adapted from the original. Ridley ascribes to the midrib of the leaves and to the peduncle a "scurfy" pubescence, which, as scales are unknown in this genus, I have interpreted as a pubescence caused by curled hairs. This is in accordance with what in other species is found. On account of the large oblong stipules and the numerous lateral nerves I have placed it in the neighbourhood of *Str. myriocarpa,* from which it should be easily distinguishable by the glabrous stem, the nearly glabrous leaves, and glabrous stipules and by the somewhat longer peduncle. Unfortunately no material was available to me for study.

5. **Streblosa myriocarpa** Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 296. 1937.

Caulis circ. 30 cm. altus; pars basalis speciminum investigatorum non conservata et habitus inde non bene notus; ad apicem 4 mm. diam., basi usque ad 9 mm. incrassatus, primum pilis rufis crispatis dense pubescens, internodiis primum complanatis et bisulcatis, deinde teres, basin versus lignescens et ibi libero crassiore dense ferrugineo-striatulo vestitus. Folia petiolo subtus primum pilis rufis dense, deinde sparsius puberulo-pubescente, 1–2 cm. longo instructa; lamina oblongo-elliptica, 15–26 cm. longa et 7–13 cm. lata, apice subobtusa, basi contracta, opaca, sicc. supra olivaceo-brunnea, subtus dilute brunnea, supra glabra, subtus costa nervis venulis pilis primum rubro-brunneis, deinde ferrugineis dense puberulo-pubescens, lepidota, raphidibus distinguendis, nervis utroque latere costae circ. 20, nervis venulisque pro genere densius reticulatis subtus prominentibus. Stipulae ambitu obovatae, 2.5 cm. longae et latae, bifidae, lobis late et oblique triangularibus 1.2 cm. longis contiguis, margine ciliolatae, extus ubique sparse puberulae, sicc. saturate rubro-brunneae, costa indistincta. Inflorescentiae pedunculo recurvato, ferrugineo-puberulo, circ. 7 mm. longo instructae; ramuli 5 subumbellati, plerumque omnes semel dichasiales, pilis ferrugineis puberulo-hirtelli, primum circ. 1.1 cm., deinde usque ad 1.6 cm. longi. Bracteae ramulorum plus minusve involucrantes, ovatae acuminatae, 7–12 mm. longae et 3.5–8 mm. latae, subglabrae; bracteae florales ovato-triangulares, inaequales, cuiusque paris inferior 2 mm., superior 1.5 mm. longa. Florum pares stipite 1 mm. longo, sparse puberulo-hirtello instructi. Flores pedicellati; pedicelli 2.7–3 mm. longi. Calyx 0.8 mm. altus, lobis ovato-triangularibus tubo aequilongis. Corolla nondum nota. Fructus vix distincte puberulus; pyrenae luteo-rubrae.

Habitat terrae Borneënsis partem austro-occidentalem.

BORNEO. Western Division: Schwaner Mts., Bukit Mulu, alt. 700 m., *Winkler 452* (HBG, TYPUS); Upper Kapuas Mts., Bukit Obat, *Winkler 1334* (HBG), n.v.

The affinity which I suppose to exist between this species and *Str. bracteata* has been discussed already. From the doubtless nearly related *Str. maxima* it differs in the shortness of the petioles, the subobtuse, on

the underside ferrugineous-puberulous leaves with their more numerous nerves and denser reticulation, and the larger size of the bracts subtending the branchlets of the inflorescence.

6. **Streblosa maxima** Brem. n. spec.; TYPUS: *Amdjah*, Exped. *v. Genderen Stort 283* (BZ).

Caulis circ. 50 cm. altus; pars basalis speciminum investigatorum non conservata et habitus inde non bene notus; ad apicem 4 mm. diam., basi usque ad 9 mm. incrassatus, primum pilis rufis crispatis dense pubescens, internodiis primum complanatis et bisulcatis, deinde teres, basin versus lignescens et ibi libero crassiore dense rubro-striatulo vestitus. Folia petiolo subtus pilis rufis primum dense, deinde sparsius puberulo-pubescente, 2–8 cm. longo instructa; lamina elliptica, 25–30 cm. longa et 11–12 cm. lata, apice caudato-acuminata, basi contracta, supra nitidula, sicc. supra saturate et subtus dilute rubro-brunnea, supra glaberrima, subtus primum ubique pilis rufis densius puberulo-pubescens, deinde costa nervis venulis satis dense, ceterum sparse puberula, lepidota, raphidibus inconspicuis, nervis utroque latere costae 11–15, nervis venulisque subtus prominulis. Stipulae ambitu obovatae, 2.7 cm. longae et 2.2 cm. latae, bifidae, lobis late et oblique triangularibus 1.2 cm. longis, margine ciliatae, costa pilis rufis dense, ceterum sparsissime puberulo-pubescentes, sicc. saturate rubro-brunneae. Inflorescentiae pedunculo recurvato, puberulo, circ. 10 mm. longo instructae; ramuli 5 subumbellati, infimi semel dichasiales, omnes pilis rufis puberulo-hirtelli, primum circ. 1.1 cm., deinde usque ad 2 cm. longi. Bracteae ramulorum triangulares, infimae 8 mm. longae, carinatae; bracteae florales inaequales, cuiusque paris inferior 2–2.5 mm. longa, superior dimidio brevior. Florum pares stipite 2 mm. longo, hirtello instructi. Flores pedicellati. Pedicelli cuiusque paris paulum inaequales, 2.5 vel 3 mm. longi. Calyx 0.8 mm. altus, lobis ovato-triangularibus tubo aequilongis. Corolla 3.5 mm. longa, tubo tereti. Fructus pilis rufis puberulo-hirtellus; pyrenae rubro-brunneae.

Habitat terrae Borneënsis partem septentrionalem.

BORNEO. Southern and Eastern Division: Tidung, G. Labang, *Amdjah*, Exped. *v. Genderen Stort 283* (BZ), TYPUS.

Streblosa maxima and *Str. myriocarpa* are very similar: both are provided with stout, densely pubescent shoots, large, on the upper side completely glabrous and on the underside, especially on the midrib and on the network of the nerves and venules, densely puberulous-pubescent leaves, large, slightly puberulous-pubescent stipules and many-flowered inflorescences with five main branchlets and pedicellate flowers. *Streblosa bracteata* is apparently a less robust plant provided with a less conspicuous indumentum, but with leaves and stipules of a similar shape and size. *Streblosa maxima* differs from *Str. myriocarpa* in the greater length of the petioles, the larger, caudate-acuminate leaves with their smaller number of nerves and more lax reticulation, the reddish brown colour of the indumentum, the inconspicuousness of the raphides, and the smaller size of the bracts at the base of the branchlets.

7. **Streblosa multiglandulosa** Merr. in Univ. Calif. Publ. Bot. 15: 288. 1929.

Caulis circ. 30 cm. altus, primum pilis rubro-brunneis crispatulis dense

villosus, deinde glabrescens, usque ad 5 mm. diam. accrescens. Folia petiolo 1–1.5 cm. longo, dense crispatulo-villoso instructa; lamina oblongo-ovata vel oblongo-obovata, 9–14 cm. longa et 4–6 cm. lata, apice acuminata, basi cuneata, subcoriacea, supra sicc. olivacea, glabra, cellulis resiniferis rubris vel brunneis punctata, subtus praesertim costa nervisque pilis rubro-brunneis vel ferrugineis conspicue crispatulo-villosa, nervis utroque latere costae circ. 13, venulis subtus prominulis. Stipulae ambitu ovatae, bifidae, 1–1.4 cm. longae. Inflorescentiae subsessiles, multiflorae, densae; ramuli circ. 1 cm. longi. Bracteae florales lineari-lanceolatae, 8–12 mm. longae et 1–1.5 mm. latae, acuminatae, rubro-striatulae, pilis rubro-brunneis pubescentes. Flores pedicellati; pedicelli 1–4 mm. longi. Fructus rubro-striatulus, plus minusve ferrugineo-villosus.

Habitat terrae Borneënsis partem septentrionalem.

BORNEO. British North Borneo, near Tawao, *Elmer 21909*, TYPUS, n.v.

The position of this species is difficult to determine. The presence of resin cells not only in the mesophyll of the bracts and in the mesocarp but also in the epidermis on the upper side of the leaves is a diagnostic character of great importance, but as these cells are found in such distantly related species as *Str. tortilis* and *Str. polyantha*, the taxonomic value of this character is small. Of more importance are the ovate stipules, the long floral bracts and the pedicellate flowers, for on account of these characters it is to be assigned a place between or next to the species 9–18, of which the first four occur, like *Str. multiglandulosa*, in Borneo and the remaining ones in the Anambas Islands and in Sumatra. The presence of curled hairs on the stem and on the underside of the leaves suggest a nearer affinity with the Bornean *Str. bullata* and *Str. bracteolata*. On account of this presumed affinity it has been assumed in the key that it belongs to the same group of Bornean species as the latter (species 8–11), and that its stipules are, like those of the other species of this group, provided with a prominent midrib. It differs from the species 8–11 in the presence of resin cells in the epidermis on the upper side of the leaves. In this respect it resembles the Sumatran *Str. polyantha*, from which it is easily distinguishable by the entirely glabrous upper side of the leaves. In the "rather rigid" leaves it resembles *Str. bracteolata*.

8. **Streblosa Johannis-Winkleri** Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 297. 1927.

Caulis usque ad 60 cm. altus, erectus, ultimo tamen prostratus et ex axillis innovationes emittens, ad apicem 1.2 mm. diam. et pilis paucis sparsus, mox glabrescens tamen et basi usque ad 3 mm. diam. incrassatus, internodiis leviter bicostatis, primum vix conspicue complanatis sed haud sulcatis, basi lignescente cortice fusco et libero crassiore sed haud distincte striatulo vestitus. Folia petiolo subtus primum pilis rufis dense vestito, deinde glabrescente, 1.5–2.5 cm. longo instructa; lamina lanceolata, 12–14 cm. longa et 4.2–5 cm. lata, utroque extremo contracta, opaca, supra sicc. nigro-brunnea, subtus dilute brunnea, supra glabra, subtus ubique pilis rufis sparsa, lepidota, raphidibus minime in foliis novellis distinguendis, nervis utroque latere costae 8–10, venulis subtus prominulis. Stipulae ambitu ovatae, 10–15 mm. longae et 7–9 mm. latae, acuminatae, bifidae, lobis 5 mm. longis, contiguis, margine et costa prominente ciliatae, ceterum

glabrae. Inflorescentiae pedunculo recurvato, sparse hirtello, 4 mm. longo instructae; ramuli 5 subumbellati, simplices, primum circ. 0.5 cm., deinde usque ad 1 cm. longi, sparse hirtelli. Bracteae ramulorum lineari-lanceolatae, 7 mm. longae et 1.5 mm. latae, subglabrae; bracteae florales margine ciliatae, inaequales, cuiusque paris inferior linearis, 3–4.5 mm. longa et 0.3–0.4 mm. lata, superior lineari-lanceolata, 1.2 mm. longa et 0.3–0.4 mm. lata, 0.5 mm. in pedicellum egrediens. Florum pares stipite 0.5 mm. longo instructi. Flores pedicellati; pedicelli 2.5 mm. longi, parce hirtelli. Calyx 0.7 mm. altus, lobis ovato-triangularibus tubo subaequilongis. Corolla 3 mm. longa, tubo tereti. Fructus parce hirtellus; pyrenae rubrae.

Habitat terrae Borneënsis partem austro-occidentalem.

BORNEO: Western Division: Schwaner Mts., Bukit Mulu, alt. 450 m., *Winkler 441* (HBG, TYPUS); Lebang Hara, alt. 150-180 m., *Winkler 352, 356* (HBG), n.v.

The stipules of this species are not only like those of *Str. maxima, Str. bullata* and *Str. bracteolata*, provided with a distinct midrib, but its internodes, moreover, are distinctly bicostate, the midribs of the stipules decurring to the preceding node, whereas the shoots of the other species are ecostate. Bicostate internodes, however, are a constant feature of the Bornean representatives of the subgenus *Para-streblosa*. Among the species belonging to the subgenus *Eu-streblosa*, to which *Str. Johannis-Winkleri*, on account of the ovate stipules, unequal floral bracts and the complete ring of hairs in the corolla-tube doubtless belongs, it comes nearest to *Str. undulata, Str. bullata* and *Str. bracteolata*, which it resembles in the shape and size of the stipules and in the nature of the indumentum. From *Str. bullata* and *Str. bracteolata* it differs conspicuously in the narrow leaves, and from *Str. undulata* in the smaller number of nerves; from all three moreover in the bicostate internodes.

9. **Streblosa undulata** Khs. interpr. Val. in Engl., Bot. Jahrb. 44: 568. 1910; an Khs. in Ned. Kruidk. Arch. II, 2: 247. 1851 = *Psychotria undulata* (Khs.) Miq., Fl. Ind. Bat. 2: 291. 1857 et Boerl., Handl. Fl. Ned. Ind. 2 (1): 139. 1891, incertum.

Caulis 50 cm. altus, ad apicem fuliginoso-villosus, basin versus lignescens. Folia petiolata; lamina lanceolata, 9–15 cm. longa et 3.5–5 cm. lata, apice sensim acuminata vel attenuata, basi attenuata, margine saepe leviter undulata, supra glabra, sicc. fusca vel olivacea, subtus ubique sed imprimis ad nervos sparse fuliginoso-villosula, sicc. pallide olivacea, nervis utroque latere costae circ. 12, subtus prominulis et colore fusco conspicuis. Stipulae late ovato-lanceolatae, bifidae, lobis acuminatis villosulis, 12 mm. longae et basi 6 mm. latae. Inflorescentiae subsessiles, densiflorae. Bracteae florales lineares, floribus aequilongae, crassiusculae, pilosae. Flores pedicellati. Pedicelli floribus aequilongi, 2–4 mm. longi. Fructus hirtellus.

Habitat terrae Borneënsis partem austro-orientalem.

BORNEO: Southern and Eastern Division: Hayup, *H. Winkler 2583*, typus descriptionis, n.v.; between Batu Babi and Lumowia, *H. Winkler 2826, 2861*, n.v.

The description given above has been based on that of Valeton, but whether the specimens investigated by the latter really are conspecific

with those collected by Korthals on Mt. Sakumbang, seems dubious, for Korthals described the leaves as elliptic and hirsute on the nerves beneath, the stipules as ovate and the bracts as oblong, whereas the leaves of Winkler's specimens are, according to Valeton's description, lanceolate and sparsely villosulous on the nerves beneath, the stipules ovate-lanceolate and the bracts linear. It is quite possible that in the future, when the flora of the south-eastern part of Borneo becomes better known, a species may be found which fits Korthals' description better than that described by Valeton. In my opinion it would have been better if Valeton had described Winkler's specimens under a new name: in the absence of the type-specimen, Korthals' species doubtless can not be regarded as sufficiently recognizable. Provisionally, however, I have accepted Valeton's interpretation.

The species described above apparently comes near to *Str. Johannis-Winkleri,* from which it differs in a somewhat more conspicuous indumentum, a larger number of nerves in the leaves, narrower stipules, and probably also by the absence of the ribs on the internodes: the latter, at any rate, are not mentioned in Valeton's description.

10. **Streblosa bullata** Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 296. 1937.

Caulis ascendens, circ. 15 cm. altus, ad apicem 1.5 mm. diam., basi usque ad 2.5 mm. incrassatus, primum pilis rufis dense pubescens, deinde plus minusve glabrescens, internodiis haud distincte sulcatis, basi libero crassiore sed haud distincte striatulo vestitus; pars decumbens radicans. Folia petiolo subtus pilis rufis primum dense, deinde sparse pubescente, 0.5–1.5 cm. longo instructa; lamina elliptica, elliptico-oblonga vel elliptico-ovata, 4.5–7.5 cm. longa et 2.7–6.2 cm. lata, apice subobtusa vel obtusa, basi ad petiolum subito contracta, opaca, sicc. supra olivacea, ad costam nervos venulos tamen pallida, subtus dilute olivacea, costa nervisque brunneis, inter nervos et venulos conspicue bullata, supra glabra, subtus costa nervis venulis a pilis primum rubro-brunneis, deinde ferrugineis dense pubescens, lepidota, raphidibus inconspicuis, nervis utroque latere costae 8–10, venulis subtus prominulis. Stipulae ambitu ovatae, 7.5–8.5 mm. longae et 8–10 mm. latae, bilobae, lobis 2.5 mm. longis, contiguis, margine ciliatae, costa densius puberulo-pubescentes, ceterum glabrae. Inflorescentiae pedunculo recurvato, sparse pubescente, 5 mm. longo instructae; bis dichasiales, 2 cm. diam. Bracteae infimae lanceolatae, 12.5 mm. longae et 4.5 mm. latae, margine ciliatae; bracteae florales lineares, margine et costa ciliatae, inaequales, cuiusque paris inferior circ. 8 mm. longa et 2 mm. lata, superior circ. 5 mm. longa et 0.8 mm. lata, in pedicellum usque ad 0.5 mm. egrediens. Flores pedicellati; pedicelli sparse hirtelli, florum in furcis dichasiorum insertorum circ. 7 mm. longi, aliorum circ. 3 mm. longi; florum pares stipite 1 mm. longo elati. Calyx 1.4 mm. altus, lobis ovato-triangularibus tubo subaequilongis. Corolla 5.5 mm. longa, tubo tereti. Fructus sparse hirtellus; pyrenae luteolae.

Habitat terrae Borneënsis partem austro-occidentalem.

Borneo. Western Division: Upper Kapuas Mts., Nanga Era, alt. 150 m., *Winkler 1560* (HBG, typus).

This species is easily distinguishable by its conspicuously bullate leaves.

Its most important character, however, is the twice dichasially branched inflorescence. In this respect it comes nearest to *Str. bracteolata,* for in both species the inflorescences are entirely cymous, whereas elsewhere the main axis bears a number of racemosely arranged branchlets. In the length of the bracts and in the comparatively large size of the flowers too, these two species resemble each other. In the nature of the stipules and in the hairiness of the nerves and venules on the underside of the leaves they resemble the other Bornean species of the subgenus *Eu-streblosa.*

11. **Streblosa bracteolata** Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 295. 1937.

Caulis ascendens, circ. 30 cm. altus, ad apicem 1.6 mm. diam., basi usque ad 3 mm. incrassatus, primum pilis fuscis dense pubescens, deinde plus minusve glabrescens, internodiis primum plus minusve complanatis sed vix sulcatis, basi libero crassiore, haud distincte striatulo vestitus; pars decumbens radicans. Folia petiolo subtus dense pubescente, 1–2 cm. longo instructa; lamina obovata vel elliptico-obovata, 6–9.5 cm. longa et 3.8–5 cm. lata, apice breviter acuminata, basi contracta, pro genere rigidior, opaca, sicc. supra olivacea, subtus dilute brunnea, supra glabra, subtus pilis fuscis ubique sed costa nervis venulis densius pubescens, lepidota, raphidibus inconspicuis, nervis utroque latere costae 8 vel 9, venulis subtus prominulis. Stipulae ambitu late ovatae, 9.5 mm. longae et 12 mm. latae, bilobae, lobis 2.5 mm. longis, margine ciliatae, costa pubescentes sed ceterum glabrae. Inflorescentiae pedunculo recurvato, pubescente, 3 mm. longo instructae; simplices. Bracteae florales infimae subaequales, lanceolatae, 12 mm. longae et 4 mm. latae, margine ciliatae; aliae lineares, extus sparse hirtellae, margine ciliatae, inaequales, cuiusque paris inferior 10 mm. longa et 1.7 mm. lata, superior 6 mm. longa et 0.9 mm. lata. Florum pares stipite 1 mm. longo elati. Flores pedicellati; pedicelli subglabri, circ. 3 mm. longi. Calyx 2 mm. altus, lobis ovato-triangularibus tubo aequilongis. Corolla 8 mm. longa, tubo tereti. Fructus sparse hirtellus; pyrenae rubro-brunneae.

Habitat terrae Borneënsis partem austro-occidentalem.

BORNEO. Western Division: Schwaner Mts., Bukit Mulu, alt. 300 m., *Winkler 1198* (HBG, TYPUS); Bidang Menabei, *Winkler 831* (HBG).

As stated above, this species comes nearest to *Str. bullata,* from which it is, however, easily distinguishable: its leaves are plane, the inflorescences unbranched, the bracts longer and the flowers larger. The relations of these two species with *Str. Johannis-Winkleri* and *Str. undulata* have been discussed already in the note at the end of the description of *Str. Johannis-Winkleri.*

Merrill, l.c., compares this species with *Str. pubescens* Ridl., of which I have seen no material, but whose position in the genus *Streblosa* seems to me very dubious. Its stipules are said to be lanceolate-acuminate, which would mean that they are entire, its stamens should be inserted at the base of the corolla-tube, and both the stamens and the style should be included. It is possible that my objections against its position are based on inaccuracies in the description, and that it is in reality a true *Streblosa.* On account of its subsessile flowers, it is, at any rate, not probable that it would belong to the nearest allies of the species described above.

12. **Streblosa anambasica** Brem. n. spec.; TYPUS: *v. Steenis 703* (L).

Caulis ascendens, circ. 40 cm. altus, ad apicem 1.5 mm. diam., basi usque ad 4 mm. incrassatus, primum pilis paucis sparsus, mox totus glabrescens, internodiis primum bisulcatis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo marginibus primum parce ciliato, 1–3.5 cm. longo instructa; lamina lanceolata, 11–14 cm. longa et 4.2–4.8 cm. lata, apice acuta vel subacuminata, basi cuneata vel subcontracta, opaca, sicc. supra saturate et subtus dilute brunnea, utrimque glabra, subtus lepidota, raphidibus inconspicuis, nervis utroque latere costae 9 vel 10, venulis sicc. colore saturatiore subtus conspicuis sed vix prominulis. Stipulae ambitu ovatae, 7 mm. altae et 6 mm. latae, acutae, bifidae, lobis contiguis 3 mm. longis, ciliatae, ceterum glabrae. Inflorescentiae pedunculo recurvato, primum pilis rufis puberulo-pubescente, deinde glabrescente, circ. 5 mm. longo instructae; ramuli 5 subumbellati, primum pubescentes, deinde glabrescentes, primum circ. 7 mm., deinde usque ad 13 mm. longi, infimi semel dichasiales. Bracteae ramulorum lineari-lanceolatae, primum subtus parce pubescentes, deinde glabrescentes, deciduae, infimae usque ad 9 mm. longae; bracteae florales lineares, paulum inaequales, cuiusque paris inferior 4–5 mm., superior 3–3.5 mm. longa, praesertim margine plus minusve distincte hirtello-pubescentes. Florum pares stipite 1 mm. longo instructi. Flores pedicellati; pedicelli circ. 1.5 mm. longi, parce hirtello-pubescentes. Calyx 0.8 mm. altus, lobis ovato-triangularibus tubo aequilongis. Corolla 1.5 mm. longa, tubo tereti. Fructus hirtellus; pyrenae luteolae.

Habitat Archipelagum Anambasicum.

ANAMBAS ISLANDS: Siantan: east of Terampa, alt. 200 m., *v. Steenis 703* (L, TYPUS).

This species occupies a rather isolated position in the genus. By the shortness of the pedicels it resembles *Str. lampongensis,* from which it differs, however, conspicuously in the shape of the stipules and in the thinness of the secondary bast. In the shape of the stipules it resembles the Bornean species 8–11 and the Sumatran species 13–17, especially the latter, for from the Bornean species it differs by the inevidence of the midrib. The Sumatran species it resembles also in the thinness of the secondary bast, but it differs from them in the larger number of branchlets in the inflorescence.

Habitually *Str. anambasica* is easily distinguishable from the other species of the subgenus *Eu-streblosa* by its glabrous leaves. The only other species with entirely glabrous leaves is *Str. leiophylla,* a plant from the Mentawei Islands, which is provided with much smaller, more compact inflorescences with three simple branchlets, larger stipules with shorter lobes, and nitidulous, in dried material olivaceous leaves.

13. **Streblosa deliensis** Brem. n. spec.; TYPUS: *Loerzing 4660* (L).

Caulis ascendens, circ. 30 cm. altus, ad apicem 1.8 mm. diam., basi usque ad 3.5 cm. incrassatus, glaber, parte novella sicc. nigrescente, internodiis primum bisulcatis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo glabro, 2–5 cm. longo instructa; lamina lanceolato-oblonga vel lanceolato-elliptica, 12–15 cm. longa et

4–6.5 cm. lata, apice acuminata vel attenuata, basi cuneata vel contracta, opaca, sicc. supra saturate olivacea, subtus dilute olivaceo-brunnea, subtus costa nervisque primum puberulo-pubescens, mox ubique glabrescens, vix conspicue lepidota, raphidibus inconspicuis, nervis utroque latere costae 9–11, venulis subtus prominulis. Stipulae ambitu ovato-lanceolatae, 10 mm. altae et 7 mm. latae, acutae, bifidae, lobis contiguis 5 mm. longis, margine ciliatae, ceterum glabrae. Inflorescentiae pedunculo recurvato, 3 mm. longo instructae; ramuli 3, simplices, 9–10 mm. longi, post anthesin vix elongati. Bracteae ramulorum ovatae, 5 mm. longae et 3 mm. latae, ciliolatae; bracteae florales lineares, inaequales, cuiusque paris inferior 5 mm. longa et 1 mm. lata, superior 2.5 mm. longa et 0.5 mm. lata. Florum pares stipite 1–1.5 mm. longo instructi. Flores pedicellati; pedicelli glabri, circ. 3 mm. longi. Calyx 0.7 mm. altus, lobis ovato-triangularibus tubo aequilongis. Corolla 1.9 mm. longa, tubo tereti. Fructus puberulus; pyrenae rubrae.

Habitat Sumatram Occidentalem.

SUMATRA. East Coast Govt.: Deli, Sibolangit, on the grounds of the Botanic Garden, alt. 450 m., *Loerzing 4660* (L, TYPUS).

Streblosa deliensis, *Str. hypomalaca*, *Str. leiophylla*, *Str. polyantha* and *Str. scabridula* resemble each other in the thinness of the secondary bast in the basal part of the stem, the ecostate stipules, and the very shortly pedunculate inflorescences with their three simple branchlets, which do not markedly elongate when the fruits ripen. They are all five endemic in Sumatra and the neighbouring Mentawei Islands. *Streblosa deliensis* differs from the four others in the narrower, bifid, not bilobate, stipules and in the ovate shape of the bracts at the base of the inflorescence. It is a nearly glabrous plant, and in this respect it comes nearest to *Str. leiophylla*, whose leaves, however, are completely glabrous and nitidulous.

14. **Streblosa hypomalaca** Brem. n. spec.; TYPUS: *Ibut 445* (L).

Streblosa hirta Ridl. in errore apud Ridl. in Kew Bull. 1926: 70. 1926, non Ridl. in Jour. As. Soc. Straits 57: 63. 1911.

Caulis usque ad 50 cm. altus, parte basali non visa, ad apicem 1.2 mm. diam., basin versus usque ad 4.5 mm. incrassatus, primum dense pubescens, deinde glabrescens, internodiis bisulcatis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo primum dense, deinde sparse pubescente, 0.5–1.8 cm. longo instructa; lamina lanceolata, 8.5–13 cm. longa et 2.5–5 cm. lata, utroque extremo attenuata, supra nitidula, sicc. supra saturate, subtus dilute olivaceo-brunnea, costa canaliculata supra pilis paucis sparsa, subtus primum dense, deinde sparsius pubescente, haud lepidota, raphidibus inconspicuis, nervis utroque latere costae 10 vel 11, venulis subtus vix prominulis. Stipulae ambitu ovato-orbiculares, 3.7–4.7 mm. altae et 4–5 mm. latae, acutae, bilobae, lobis contiguis 1.2 mm. longis, margine ciliatae, ceterum glabrae. Inflorescentiae pedunculo recurvato, puberulo-hirtello, 3 mm. longo instructae; ramuli 3, simplices, 9 mm. longi, post anthesin vix elongati, puberulo-hirtelli. Bracteae ramulorum lineares, 7 mm. longae, apice puberulo-hirtellae; bracteae florales etiam lineares, inaequales, cuiusque paris inferior 5 mm. longa et 1.3 mm. lata, superior 2.5 mm. longa et 0.7 mm. lata. Florum pares stipite 1 mm. longo instructi. Flores pedicellati; pedicelli apicem versus

sparse hirtelli, 2.3 mm. longi. Calyx 0.6 mm. altus, lobis ovatis tubo paulo longioribus. Corolla nondum aperta 1.8 mm. longa, tubo tereti. Fructus hirtellus; pyrenae rubrae.

Habitat insulam Siporam in Archipelago Mentaweiensi.

MENTAWEI ISLANDS. Sipora: near Sioban, *Ibut 445* (L, TYPUS).

Ibut accompanied Boden Kloss on his visit to the Mentawei Islands as collector for the Botanical Gardens, Buitenzorg, and the types of this species and the next were collected on the same dates as the specimens quoted by Ridley, l.c., under the names *Str. hirta* and *Str. microcarpa*. It can therefore hardly be doubted that they are identical with the latter.

The stipules of *Str. hypomalaca* are of the same shape as those of *Str. leiophylla, Str. polyantha* and *Str. scabridula,* but they are much smaller. A remarkable feature of this species is the comparatively short petioles: in this respect it resembles the Bornean *Str. bullata* and *Str. bracteolata.*

15. **Streblosa leiophylla** Brem. n. spec.; TYPUS: *Ibut 98* (L).
Streblosa microcarpa Ridl. in errore apud Ridl. in Kew Bull. **1926**: 70. 1926, non Ridl., Fl. Mal. Pen. 2: 148. 1923.

Caulis ascendens, circ. 40 cm. altus, ad apicem 1.6 mm. diam., basi usque ad 5 mm. incrassatus, glaber, parte novella sicc. fuscescente, internodiis primum complanatis sed haud distincte sulcatis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo glabro, 1–3.5 cm. longo instructa; lamina elliptico-oblonga, 9–15 cm. longa et 5.5–7.5 cm. lata, apice acuta vel subacuminata, basi contracta, supra nitidula, sicc. supra saturate et subtus dilute olivaceo-brunnea, utrimque glaberrima, subtus haud lepidota, raphidibus inconspicuis, nervis utroque latere costae 12 vel 13, venulis subtus prominulis. Stipulae ambitu ovato-orbiculares, 11 mm. altae et 10 mm. latae, acutae, bilobae, lobis contiguis 3 mm. longis, margine fugaciter ciliatae, ceterum glabrae. Inflorescentiae pedunculo recurvato, subglabro, 4 mm. longo instructae; ramuli 3 simplices, circ. 9 mm. longi, post anthesin vix elongati. Bracteae ramulorum lineari-lanceolatae, 6.5 mm. longae, subglabrae; bracteae florales lineares, extus dimidio superiore puberulae, inaequales, cuiusque paris inferior 4.5–5 mm. longa, superior 3–3.5 mm. longa. Florum pares stipite 1 mm. longo instructi. Flores pedicellati; pedicelli sparse hirtelli, 1.5 mm. longi. Calyx 0.8 mm. longus, lobis ovatis tubo paulo longioribus. Corolla matura nondum visa. Fructus apice puberulo-hirtellus; pyrenae luteolae.

Habitat insulam Archipelagi Mentaweiensis Siberut dictam.

MENTAWEI ISLANDS. Siberut: near the village of the same name, *Ibut 98* (L, TYPUS).

This species is easily recognizable by the completely glabrous stem and leaves. In the size of the stipules it resembles *Str. polyantha* and *Str. scabridula,* but in other respects it is more like *Str. hypomalaca,* the other species from the Mentawei Islands; its leaves are like those of the latter, on the underside smooth, not lepidote as in *Str. polyantha* and *Str. scabridula*, i.e. they lack the pallid protuberances by which in the latter the stomata are raised above the general level of the epidermis, and the flower-pairs are provided with a stipe of the same length as that of *Str.*

hypomalaca, and longer than that found in *Str. polyantha* and in *Str. scabridula.*

16. **Streblosa polyantha** Khs. in Ned. Kruidk. Arch. 2 (2): 246. 1851; Miq. in Ann. Mus. Bot. Lugd.-Bat. 4: 262. 1869.

Psychotria singalénsis Miq., Fl. Ind. Bat. 2: 294. 1858, n. nom., Suppl. 223. 1860; Boerl., Handl. Fl. Ned. Ind. 2 (1): 139. 1891.

Streblosa hirta Ridl. in Jour. As. Soc. Straits 57: 63. 1911, cuius folia angustiora videntur, adhuc incertum sed haud improbabile.

Caulis probabiliter circ. 25 cm. alta, sed parte basali in speciminibus investigatis non conservata, ad apicem 1.5 mm. diam., basin versus usque ad 3 mm. incrassatus, primum dense villosus, ultimo plus minusve glabrescens, internodiis primum bisulcatis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo primum dense, deinde minus dense villoso, 1–3 cm. longo instructa; lamina elliptica vel oblongo-elliptica, 9–12 cm. longa et 4.5–5.7 cm. lata, apice acuta vel acuminata, basi contracta, opaca, sicc. supra olivacea et cellulis resiniferis nigro-punctata, utrimque sparse villosa, costa nervisque subtus tamen densius villosa, subtus lepidota, raphidibus supra ad costam distinguendis, ceterum inconspicuis, nervis utroque latere costae 9 vel 10, venulis subtus vix prominulis. Stipulae ambitu ovato-orbiculares, 12 mm. altae lataeque, acutae, breviter bilobae, lobis contiguis 3 mm. longis, margine ciliatae, ceterum glabrae. Inflorescentiae pedunculo recurvato, circ. 3 mm. longo instructae; ramuli 3 simplices, circ. 9 mm. longi, post anthesin vix elongati. Bracteae omnes lineares, margine ciliatae, ramulorum 5 mm. longae, florales inaequales, cuiusque paris inferior 3.5 mm., superior 2.5 mm. longa. Florum pares stipite 0.5 mm. longo elati. Flores pedicellati; pedicelli glabri, circ. 1.5 mm. longi. Calyx 0.8 mm. altus, lobis ovato-triangularibus tubo aequilongis. Corolla 1.5 mm. longa, tubo tereti. Fructus ad apicem hirtellus; pyrenae nigrae.

Habitat Sumatram Occidentalem et forsitan Peninsulam Malayanam.

SUMATRA. West Coast Res.: G. Malintang, *Korthals s.n.* (L, U, TYPI).

MALAY PENINSULA. Penang et Perak (*Str. hirta* Ridl.) n.v.

The leaves of *Str. hirta* Ridl. have been described as slightly narrower than those of *Str. polyantha* (10–15 cm. × 3.7–5 cm. instead of 9–12 cm. × 4.5–5.7 cm.), but as the description reveals no other points of difference, I am, for the moment, unwilling to accept it as specifically distinct. Ridley had seen no material of Korthals' species, and the existing descriptions were too incomplete to be of much use. It is, of course, not impossible that a renewed investigation will reveal the presence of more important differences.

Streblosa polyantha resembles the next species in many respects, but is easily distinguishable by the softness of the indumentum, by the somewhat broader leaves, which are provided with a smaller number of nerves and with resin cells in the epidermis of the upper side, and further, by the black pyrenes.

17. **Streblosa scabridula** Brem. n. spec.; TYPUS: *Docters v. Leeuwen 3194* (L).

Caulis ascendens, circ. 40 cm. altus, ad apicem 1.5 mm. diam., basi usque ad 5.5 mm. incrassatus, primum dense, deinde sparse hirsutus,

internodiis primum vix distincte bisulcatis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo primum dense, deinde sparsius hirsuto, 1–3 cm. longo instructa; lamina lanceolato-oblonga, 9–14.5 cm. longa et 3–5 cm. lata, apice acuminata, basi contracta, supra nitidula, sicc. supra saturate et subtus dilute olivaceo-brunnea, utrimque sed praesertim subtus costa nervisque scabrido-hirsuta, subtus vix distincte lepidota, raphidibus inconspicuis, nervis utroque latere costae 12 vel 13, venulis subtus prominulis. Stipulae ambitu ovato-orbiculares, 17 mm. altae et 13 mm. latae, acutae, bilobae, lobis contiguis 4 mm. longis, margine ciliatae, ceterum glabrae. Inflorescentiae pedunculo recurvato, 4 mm. longo instructae; ramuli 3 simplices, circ. 9 mm. longi, post anthesin vix elongati. Bracteae omnes lineares, margine dense ciliatae; florales inaequales, cuiusque paris inferior 4 mm., superior 3 mm. longa. Florum pares stipite 0.5 mm. longo instructi. Flores pedicellati; pedicelli sparse hirtelli, circ. 2 mm. longi. Calyx 0.8 mm. altus, lobis ovato-triangularibus tubo aequilongis. Corolla 3 mm. longa, tubo tereti. Fructus apice hirtellus; pyrenae rubrae.

Habitat Sumatram Orientalem.

SUMATRA. East Coast Govt.: Asahan, Haboko, *Docters v. Leeuwen 3194* (L, TYPUS).

The differences between this species and the nearly related *Str. polyantha* have already been discussed. From the other species belonging to this genus they differ in the presence of fairly long hairs on the upper side of the leaves.

Subgenus **Para-streblosa.**

Folia subtus numquam lepidota. Stipulae parvae, parte basali indivisa brevi. Bracteae cuiusque paris subopppositae et subaequales. Flores semper subsessiles. Corollae tubus teres, intus fasciculis 5 pilorum instructus. Fructus nunc didymus, nunc globosus. — Species 18–25, in terra Borneënsi et insulis Filippinis endemicae.

Series **Costatae.**

Stipulae costa prominente et usque ad nodum praecedentem decurrente instructae; lobi stipulares contigui. — Species 18–23, omnes Borneënses.

18. **Streblosa chlamydantha** Brem. n. spec.; TYPUS: *Endert 2414* (BZ).

Caulis ascendens, circ. 1 m. altus, interdum pseudo-dichotome furcatus, ad apicem 2 mm. diam., basi usque ad 9 mm. incrassatus, primum puberulus, internodiis primum bisulcatis, sulcis tamen mox expletis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo primum puberulo, deinde glabrescente, 0.8–6 cm. longo instructa; lamina oblanceolata vel elliptica, foliorum supremorum 12–13 cm. longa et 5.5–6.5 cm. lata, inferiorum usque ad 19 cm. longa et 9 cm. lata, omnium apice caudato-acuminata, basi contracta, opaca, sicc. supra saturate brunnea, subtus dilute olivaceo-brunnea, supra glabra, subtus primum costa nervis venulis dense puberula, ultimo plus minusve glabrescens, subtus raphidibus dense lineolata, nervis utroque latere costae plerumque 14–15, venulis subtus vix prominulis. Stipulae fugaces, parte indivisa 1 mm. alta, lobis e basi triangulari filiformibus, 3–4 mm. longis. Inflorescentiae pedunculo recurvato, usque ad 5 mm. longo instructae; ramuli 5, subumbellati, pri-

mum circ. 7 mm. longi et toti bracteis imbricatis obtecti, deinde bracteis exutis usque ad 3.5 cm. elongati, puberulo-pubescentes. Bracteae ramulorum oblanceolatae; bracteae florales obovatae, 3.7 mm. longae et 2.8 mm. latae, margine vix conspicue ciliolatae, ceterum glabrae, raphidibus conspicue lineolatae. Florum pares estipitati. Calyx subglaber, circ. 1.2 mm. altus, fere usque ad basin in lobos ovato-oblongos, imbricatos, distincte inaequales, margine vix conspicue ciliolatos partitus. Corolla 2 mm. longa. Fructus didymus, puberulus; pyrenae luteo-brunneae.

Habitat terrae Borneënsis partem centro-orientalem.

BORNEO. Southern and Eastern Division: West Kutai, near B. Puhus, alt. 70 m., *Endert 2414* (BZ, TYPUS).

Streblosa chlamydantha and *Str. longiscapa*, both inhabitants of the central part of East Borneo, are the tallest plants of this genus, for both reach a height of about one meter. They are, moreover, not rarely pseudo-dichotomously branched, but this peculiarity has also been observed in *Str. lampongensis*. From the other species of *Para-streblosa* they differ conspicuously in the didymous fruits. *Streblosa chlamydantha*, moreover, is easily recognizable by the large size of the bracts and by the large, distinctly unequal, imbricate calyx-lobes.

19. **Streblosa longiscapa** Brem. n. spec.; TYPUS: *Endert 3479* (BZ).

Caulis circ. 1 m. altus, interdum pseudo-dichotome furcatus, parte basali in speciminibus investigatis non conservata, ad apicem 2 mm. diam., basin versus usque ad 5 mm. incrassatus, glaber, internodiis primum bisulcatis, sulcis tamen mox expletis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo primum puberulo, mox glabrescente, 0.8–4 cm. longo instructa; lamina lanceolata, rhomboidea vel elliptica, foliorum superiorum 6 cm. longa et 2.5 cm. lata, inferiorum usque ad 19 cm. longa et 9.5 cm. lata, omnium apice caudato-acuminata, basi contracta, opaca, sicc. supra saturate brunnea, subtus dilute olivaceo-brunnea, supra glabra, subtus primum costa nervis venulis dense puberula, ultimo plus minusve glabrescens, subtus raphidibus dense lineolata, nervis utroque latere costae in foliis supremis 8, in foliis aliis usque ad 17, venulis subtus vix conspicuis. Stipulae fugaces, parte indivisa circ. 2 mm. alta, lobis e basi triangulari filiformibus 4–6 mm. longis. Inflorescentiae pedunculo erecto, folio praecedenti subaequilongo vel eo paulo breviore, bicostato, glabrescente instructae; ramuli 9 paniculatim dispositi, semel dichasiales, puberulo-pubescentes; laterales centrali multo longiores. Bracteae ramulorum anguste triangulares, 2–3 mm. longae; bracteae florales lineares, 1.3–1.5 mm. longae, puberulo-pubescentes. Florum pares stipite 0.4 mm. longo instructi. Calyx puberulo-pubescens, 0.6 mm. altus, fere usque ad basin in lobos ovatos subobtusos partitus. Corolla matura nondum visa. Fructus didymus, subglaber; pyrenae luteolae.

Habitat terrae Borneënsis partem centro-orientalem.

BORNEO. Southern and Eastern Division: West Kutai, along the river Kiai, alt. 700 m., *Endert 4562* (BZ); H. Petak, alt. 500 m., *Endert 3479* (BZ, TYPUS).

This species is easily distinguishable by its long-pedunculate, paniculate inflorescences. As stated above, it is doubtless closely related to *Str. chlamydantha*.

20. **Streblosa lanceolata** Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 297. 1937.

Caulis ascendens, circ. 50 cm. altus, ad apicem 1.2 mm. diam., basi usque ad 3 mm. incrassatus, glaber, internodiis primum bisulcatis sed sulcis mox expletis, basi lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo primum puberulo, mox glabrescente, 0.7–1.5 cm. longo instructa; lamina anguste lanceolata, 10–16 cm. longa et 2.0–3.3 cm. lata, apice caudato-attenuata, basi cuneata, opaca, sicc. supra saturate olivacea, subtus griseo-viridis, primum utrimque puberula, mox glabrescens, subtus raphidibus dense lineolata, nervis utroque latere costae 9 vel 10, venulis paucis vix conspicuis. Stipulae fugaces, parte indivisa 1 mm. alta, lobis e basi triangulari filiformibus 2 mm. longis. Inflorescentiae pedunculo patente, subglabro, usque ad 4 mm. longo instructae; ramuli plerumque 5 subumbellati, primum circ. 5 mm., deinde usque ad 15 mm. longi, infimi semel dichasiales, subglabri. Bracteae omnes triangulares, puberulae, circ. 1 mm. longae; bracteae florales quam ramulorum paulo latiores tamen, margine vix conspicue ciliolatae, deciduae. Calyx puberulus, 0.7 mm. longus, lobis ovato-triangularibus tubo subaequilongis. Corolla nondum nota. Fructus globosus, glaber; pyrenae luteolae.

Habitat terrae Borneënsis partem austro-occidentalem.

Borneo. Western Division: Upper Kapuas Mts., Bukit Obat, alt. 90 m., *Winkler 1392* (HBG, typus); ibidem, Liang Gagang, *Hallier 2391* (L).

Streblosa lanceolata, *Str. urticina*, *Str. glabra* and *Str. assimilis* resemble each other in the globose fruits, the short calyx-lobes and the shortly pedunculate inflorescences. *Streblosa lanceolata* and *Str. urticina* resemble each other also in other respects, for instance in the shape and size of the leaves and in the conspicuousness of the raphides on the underside, and also in the early deciduous bracts. The leaves of *Str. lanceolata*, however, are slightly narrower and shorter petiolate. The peduncles of this species too, are distinctly shorter. The leaves of *Str. glabra* and *Str. assimilis* are much wider, and the raphides are invisible; their bracts persist for a longer period.

21. **Streblosa urticina** Stapf in Trans. Linn. Soc. Bot. II. 4: 182, t. 13A, f. 1–10. 1894; Ridl. in Jour. As. Soc. Straits 57: 64. 1911, speciminibus in Sarawak lectis probabiliter exclusis (cf. *Str. assimilis* Brem.).

Caulis ascendens, probabiliter circ. 50 cm. altus, ad apicem 1.2 mm. diam., basi usque ad 3.5 mm. incrassatus, internodiis primum bisulcatis sed sulcis mox expletis, basi lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo 0.7–3 cm. longo instructa; lamina lanceolata vel oblongo-lanceolata, 11–16 cm. longa et 4–6 cm. lata, apice caudato-acuminata, basi contracta, opaca, sicc. supra saturate, subtus dilute olivacea, subtus raphidibus lineolata, nervis utroque latere costae 10–12, venulis subtus vix conspicuis. Stipulae e parte indivisa, 0.8 mm. alta, subpersistente et lobis e basi triangulari filiformibus, fugacibus compositae. Inflorescentiae pedunculo patente, 1.2–1.5 cm. longo instructae; ramuli plerumque 3, simplices vel semel dichasiales, primum 5–10 mm. longi, postea usque ad 25 mm. accrescentes. Bracteae omnes triangulares, 0.6 mm. longae, mox deciduae. Calyx 0.4 mm. altus, lobis rotundatis tubo aequilongis. Corolla matura nondum nota. Fructus globosus; pyrenae rubro-brunneae.

Habitat terrae Borneënsis partem septentrionalem.

Species haec solvenda est in varietates duas; forma typica a me vocatur:

Streblosa urticina Stapf var. **Stapfii** Brem. n. nom.

Caulis primum puberulus, deinde glabrescens. Folia petiolo primum dense, deinde sparsius puberulo instructa; lamina primum utrimque sed praesertim subtus costa nervisque puberula, deinde plus minusve glabrescens, raphidibus supra inconspicuis. Inflorescentiae dense puberulae. Fructus puberulo-hirtellus.

Habitat terrae Borneënsis partem septentrionalem.

BORNEO: British North Borneo: Mt. Kinabalu, Penokok, alt. 1000 m., *Haviland 1328* (K, TYPUS), n.v.; Penibukan, ridge east of Dahobang Ridge, alt. 1200–1500 m., *J. & M. S. Clemens 30698* (L); Penataran River, alt. 1000 m., *J. & M. S. Clemens 34029* (L).

The habit was described by Stapf as climbing, but it was pointed out already by Ridley l.c. that this is a mistake. The flowers are according to Stapf 4-merous, but as the plate accompanying his description clearly shows, they are in reality, as elsewhere in this genus, 5-merous.

Streblosa urticina Stapf var. **glabrescens** Brem. n. var.; TYPUS var.: *Amdjah*, Exped. *v. Genderen Stort, 371* (BZ).

Caulis glaberrimus. Folia mox tota glabrescentia, raphidibus utrimque lineolata. Inflorescentiae pedunculo glabro instructae, ceterum parce puberulae. Fructus subglaber.

Habitat terrae Borneënsis partem septentrionalem.

BORNEO. Southern and Eastern Division: Tidung, G. Labang, *Amdjah* (Exped. *v. Genderen Stort*) *371* (BZ, TYPUS varietatis).

The G. Labang, where this specimen was collected, lies near the British-North-Bornean frontier.

Streblosa urticina and *Str. lanceolata* are doubtless closely related. As stated above, the leaves of *Str. urticina* are slightly wider and longer petiolate, and the peduncles are much longer. *Streblosa urticina*, moreover, appears to be a plant occurring at a higher altitude: the specimens of the var. *Stapfii* at least were all collected between 1000 and 1500 m., whereas *Str. lanceolata* was found at a height of 90 m. *Streblosa urticina*, *Str. microcarpa* and *Str. axilliflora* are the only species found above 1000 m. altitude, but the two latter have also been collected in localities less high.

22. **Streblosa glabra** Val. in Engl., Bot. Jahrb. 44: 567. 1910; non Elm., Leafl. Philipp. Bot. 4: 1356. 1912, quae est *Str. palawanensis* Brem.; nec Merr., Enum. Philipp. Fl. Pl. 3: 564. 1921, quae est p.p. *Str. axilliflora* Merr. et p.p. *Str. palawanensis* Brem.

Streblosa platyphylla Merr. in Univ. Calif. Publ. Bot. 15: 288. 1929.

Caulis ascendens, circ. 30 cm. altus, ad apicem circ. 2 mm. diam., basi usque ad 3 mm. incrassatus, primum vix conspicue puberulus, mox glabrescens, internodiis primum bisulcatis sed sulcis mox expletis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo primum puberulo, deinde plus minusve glabrescente, 1.2–5 cm. longo instructa; lamina elliptica, 14–17 cm. longa et 8–10 cm. lata, apice breviter caudato-acuminata, basi contracta, opaca, sicc. supra saturate,

subtus dilute olivaceo-brunnea, primum utrimque sed praesertim subtus costa nervisque puberula, deinde glabrescens, raphidibus inconspicuis, nervis utroque latere costae circ. 10, venulis subtus vix prominulis. Stipulae subpersistentes, parte indivisa 2 mm. alta, lobis e basi triangulari filiformibus, 2.5 mm. longis, costa decurrente pro serie debili. Inflorescentiae pedunculo patente, primum dense, deinde sparse puberulo, 7–12 mm. longo instructae; ramuli plerumque 3, simplices vel semel dichasiales, subumbellati, dense puberuli, 5–10 mm. longi, post anthesin vix accrescentes. Bracteae omnes 2 mm. longae et sparse puberulae, ramulorum lineares, florales oblongae. Calyx puberulus, 0.4 mm. longus, lobis rotundatis tubo subaequilongis. Corolla 3.2 mm. longa, tubo tereti. Fructus globosus, puberulo-hirtellus; pyrenae luteolae.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Southern and Eastern Division: between Kondim Baru and Batu Babi, *H. Winkler 2751* (L, dupl. TYPI). BRITISH NORTH BORNEO: Elphinstone Prov., Tawao, *Elmer 21140* (U, AA, exempla typi *Str. platyphylla* Merr.).

The name of this species is somewhat misleading, for it is by no means completely glabrous. It may have influenced Merrill when he investigated the plants collected by Elmer at Tawao. Merrill described the leaves of the latter as "praesertim ad costam nervosque plus minusve sordide villosis," and a detached leaf added to one of the specimens in the herbarium of the Arnold Arboretum, indeed answers this description, but this leaf, which differs from the others not only in the nature of the indumentum but also in the colour it assumed in the press, and in the conspicuousness of the raphides, is either teratological or, more probably, part of another species. It is possible that the type-specimen consists of stems provided with this kind of leaves, but in view of the fact that the rest of the descripion agrees with that given above, this seems less probable than the supposition that the type too consists of leaves of both kinds. Acting on this supposition, I have reduced *Str. platyphylla* to *Str. glabra*. Whether the aberrant leaf belongs to a *Streblosa* species, is, of course, difficult to decide, but in view of the great similarity in the nervation, this does not look improbable to me.

Streblosa glabra differs from the two preceding species in the greater width of the leaves and in the inconspicuousness of the raphides, and also in the subpersistent stipules and bracts. From the next species it differs in the smaller size of the leaves, which, moreover, are provided with a smaller number of nerves, and in the smaller size of the flowers. The internodes of *Str. glabra* are less distinctly bicostate than those of the other species belonging to this series, but the ribs are nevertheless plainly visible.

23. **Streblosa assimilis** Brem. n. spec.; TYPUS: *Hallier 2725* (L).
Streblosa urticina Stapf apud Ridl. in Jour. As. Soc. Straits 57: 64. 1911, quoad specimina in Sarawak lecta, adhuc incertum.

Caulis probabiliter ascendens, sed parte basali in speciminibus investigatis non conservata, ad apicem 2 mm. diam., basin versus usque ad 7 mm. incrassatus, glaber, internodiis primum bisulcatis sed sulcis mox expletis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia

petiolo glabro, 1.5–8 cm. longo instructa; lamina elliptica, 17–27 cm. longa et 8.5–12 cm. lata, apice breviter caudato-acuminata, basi acuta vel rotundata sed prope petiolum semper contracta, opaca, sicc. supra saturate et subtus dilute olivaceo-brunnea, primum vix conspicue puberula, mox glaberrima, raphidibus inconspicuis, nervis utroque latere costae circ. 13, venulis subtus vix prominulis. Stipulae subpersistentes, parte indivisa 2 mm. alta, lobis e basi triangulari filiformibus. Inflorescentiae pedunculo patente, parce puberulo, 4 mm. longo instructae; ramuli 3 vel 5, subumbellati, simplices vel semel dichasiales, primum 5–7 mm. longi, post anthesin paulum elongati. Bracteae omnes ovatae, 2 mm. longae, subglabrae. Calyx puberulus, 0.6 mm. altus, lobis rotundatis tubo aequilongis. Corolla 6 mm. longa, tubo tereti. Fructus globosus, subglaber, maturus nondum notus.

Habitat terrae Borneënsis partem austro-occidentalem.

BORNEO. Western Division: Upper Kapuas Mts., Liang Gagang, *Hallier 2725* (L, TYPUS); ibidem, *Hallier 2584* (L).

Very similar to the preceding species and by *Valeton* regarded as a mere variety of the latter (*Str. glabra* Val. var. *brevipes* Val. in sched.), but differing in several points: the stem is glabrous, more strongly bicostate and more robust, the leaves are larger, provided with a larger number of nerves and almost completely glabrous, the peduncle is shorter and the flowers are nearly twice as large.

It is not impossible that *Ridley 12430* from Puak and *12432* from Lundu in Sarawak, which Ridley referred to *Str. urticina*, but of which he says: "They are more robust with larger leaves, the stems quite woody and erect," may prove to belong to the species described above.

Series Ecostatae.

Stipulae et internodia ecostatae; lobi stipulares sinu latiore separati. — Species 24–25, in Palawan et insulis Filippinis endemicae.

24. **Streblosa palawanensis** Brem. n. spec.; TYPUS: *Merrill 11586* (L).

Caulis suberectus, circ. 40 cm. altus, ad apicem circ. 1.5 mm. diam., basi usque ad 4 mm. incrassatus, internodiis haud sulcatis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo primum subtus fusco-puberulo, mox glabrescente, 1–5 cm. longo instructa; lamina elliptico-lanceolata, 9.5–17 cm. longa et 3.8–6.2 cm. lata, apice caudato-acuminata, basi contracta, primum subtus costa nervisque plus minusve puberula, nervis utroque latere costae 9–12, venulis subtus vix prominulis. Stipulae fugaces, parte indivisa 0.5–1 mm. alta, lobis linearibus, 1.5–1.8 mm. longis, sinu rectangulari 1.5 mm. lato separatis. Inflorescentiae pedunculo patente, fusco-puberulo, 5–9 mm. longo instructae; ramuli plerumque 3, semel dichasiales, subumbellati, fusco-puberuli, primum 0.5–1 cm. longi, deinde usque ad 2.5 cm. elongati. Bracteae omnes triangulares, fusco-puberulae, ramulorum usque ad 2 mm., florales 1–1.5 mm. longae. Calyx fusco-puberulus, 0.5 mm. altus, lobis late triangularibus tubo paulo longioribus. Corolla nondum matura 3.5 mm. longa, tubo tereti. Fructus globosus; pyrenae luteolae.

Habitat insulam Palawan dictam.

Species haec in varietates duas solvenda; forma typica a me vocatur:

Streblosa palawanensis Brem. var. **Merrillii** Brem. n. nom.

Lamina foliorum nitidula, sicc. utrimque olivacea, subtus raphidibus lineolata. Fructus vix conspicue hirtello-puberulus.

Habitat insulam Palawan dictam.

PALAWAN: Malampayan Bay, *Merrill 11586* (L, TYPUS, AA, dupl. typi).

Streblosa palawanensis Brem. var. **Elmeri** Brem. n. var.; TYPUS var.: *Elmer 12885* (L).

Streblosa glabra Val. in errore apud Elmer, Leafl. Philipp. Bot. 4: 1356. 1912; et apud Merr. Enum. Philipp. Fl. Pl. 3: 564. 1923, quoad specimen in Palawan lectum.

Lamina foliorum opaca, sicc. utrimque brunnea, raphidibus inconspicuis. Fructus conspicue hirtellus.

Habitat insulam Palawan dictam.

PALAWAN: Puerta Princesa, Mt. Pulgar, trail to Napsan, alt. 750 m., *Elmer 12285* (L, TYPUS var., AA, dupl.).

Elmer, l.c., describes the leaves of this plant as nitidulous, but in dried condition they are dull. A few inaccuracies of his description have already been pointed out in the introduction to this paper.

Strcblosa palawanensis resembles *Str. axilliflora* in the ecostate internodes and in the wide gap between the two stipular lobes, but differs from that species in the absence of grooves in the young internodes, in the size and shape of the stipular lobes and in the shape of the gap by which the latter are separated from each other, and also in the somewhat larger size of the flowers.

25. **Streblosa axilliflora** Merr. in Philipp. Jour. Sci. Bot. 10: 144. 1915.

Streblosa glabra Val. in errore apud Merr., Enum. Philipp. Fl. Pl. 3: 564. 1923, quoad specimina in Luzon et Catanduanes lecta.

Caulis ascendens, plerumque 15–30 cm. altus, ad apicem circ. 1.5 mm. diam., basi usque ad 3 mm. incrassatus, internodiis haud profunde sed latius sulcatis, basin versus lignescens et ibi libero tenui, haud striatulo vestitus. Folia petiolo glabro vel primum fusco-puberulo, 1.5–5 cm. longo instructa; lamina nunc elliptico-lanceolata, 10–14 cm. longa et 4.2–5.4 cm. lata, nunc elliptica, circ. 8 cm. longa et 5.5 cm. lata, apice acuta vel vix conspicue acuminata, basi contracta, opaca vel nitidula, sicc. supra saturate et subtus dilute olivacea, primum subtus costa nervisque fusco-puberula, deinde plus minusve glabrescens, raphidibus subtus interdum distinguendis, nervis utroque latere costae 9 vel 10, venulis subtus vix prominulis. Stipulae fugaces, parte indivisa 1.5 mm. alta, lobis e basi circ. 3 mm. lata sensim attenuatis, 6–7 mm. longis, sinu 1–1.5 mm. lato, basi rotundato separatis. Inflorescentiae pedunculo patente, fusco-puberulo, circ. 3 mm. longo instructae; ramuli plerumque 3, semel dichasiales, subumbellati, fusco-puberuli. Bracteae ramulorum triangulares, 3–4 mm. longae; bracteae florales multo minores, plerumque circ. 1 mm. longae, margine parce ciliolatae. Calyx fusco-puberulus, 0.6 mm. altus, lobis triangularibus tubo paulo longioribus. Corolla circ. 2 mm. longa. Fructus globosus, hirtello-puberulus; pyrenae luteolae.

Habitat partem insulae Luzoniae australem et insulam Catanduanes dictam.

Species haec in varietates probabiliter plures solvenda est quarum tres ibi descriptae sunt; forma typica a me vocatur:

Streblosa axilliflora Merr. var. **angustifolia** Brem. n. nom.

Caulis glaber vel primum fusco-puberulus. Lamina foliorum elliptico-lanceolata, 10–14 cm. longa et 4.2–5.4 cm. lata. Ramuli inflorescentiarum post anthesin vix elongati, circ. 8 mm. longi.

Habitat partem Insulae Luzoniae australem.

LUZON. Camarines Sur: Panagan River, alt. 700 m., *Edaño* [B. Sc.] *76348* (NY); Kamugong River, alt. 400 m., *Edaño* [B. Sc.] *75901* (NY); Sorsogon: Irosin, Mt. Bulusan, *Elmer 14605* (L, U, NY); s.l. *Ramos* [B. Sc.] *23560* (NY).

Streblosa axilliflora Merr. var. **latifolia** Brem. n. var.; TYPUS var.: *Ramos* & *Edaño* [B. Sc.] *45421* (NY).

Caulis densius puberulus. Lamina foliorum elliptica, circ. 8 cm. longa et 5.5 cm. lata. Ramuli inflorescentiarum post anthesin vix elongati, circ. 8 mm. longi.

Habitat partem Insulae Luzoniae australem.

LUZON. Tayabas: Casiguran, *Ramos* & *Edaño* [B. Sc.] *45421* (NY, TYPUS var., AA, dupl.).

Streblosa axilliflora Merr. var. **laxiflora** Brem. n. var.; TYPUS var.: *Ramos* & *Edaño* [B. Sc.] *75308* (NY).

Caulis glaber. Lamina foliorum elliptico-lanceolata, circ. 12 cm. longa et 5 cm. lata. Ramuli inflorescentiarum post anthesin usque ad 1.8 cm. elongati.

Habitat insulam Catanduanes dictam.

CATANDUANES: Mt. Abucay, alt. 1400 m., *Ramos* & *Edaño* [B. Sc.] *75308* (NY, typus var.); ibid., alt. 600 m., *Ramos* & *Edaño* [B. Sc.] *75466* (NY); Bato trail to Viga, alt. 250 m., *Ramos* & *Edaño 75557* (NY).

It is not impossible that this variety, when more material becomes available, will prove to be sufficiently distinct to be raised to specific rank.

Merrill, l.c., quotes specimens collected in Samar, but as I did not see them, I am unable to express an opinion with regard to their taxonomic position.

Index Specierum

12. *anambasica* Brem. n. spec. — Anambas Islands.
23. *assimilis* Brem. n. spec. — West Borneo.
25. *axilliflora* Merr. in Philipp. Jour. Sci., Bot. 10: 141. 1915 — Philippines.
    var. *angustifolia* Brem. n. nom. — Luzon.
    var. *latifolia* Brem. n. var. — Luzon.
    var. *laxiflora* Brem. n. var. — Catanduanes.
4. *bracteata* Ridl. in Jour. As. Soc. Straits 57: 64. 1911 — West Borneo.
11. *bracteolata* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 295. 1937 — West Borneo.
10. *bullata* Merr. op. cit. 296 — West Borneo.
18. *chlamydantha* Brem. n. spec. — East Borneo.
13. *deliensis* Brem. n. spec. — East Sumatra.
22. *glabra* Val. in Bot. Jahrb. 44: 567. 1910 — East Borneo.
    hirta Ridl. in Jour. As. Soc. Straits 57: 63. 1911, forsitan = *polyantha*, n.v.
14. *hypomalaca* Brem. n. spec. — Mentawei Islands.

8. *Johannis-Winkleri* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 297. 1937. — West Borneo.
3. *lampongensis* Brem. n. spec. — South Sumatra.
20. *lanceolata* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 297. 1937 — West Borneo.
15. *leiophylla* Brem. n. spec. — Mentawei Islands.
19. *longiscapa* Brem. n. spec. — East Borneo.
6. *maxima* Brem. n. spec. — North Borneo.
2. *microcarpa* Ridl., Fl. Mal. Pen. 2: 148. 1923 — Malay Peninsula and Sumatra.
7. *multiglandulosa* Merr. in Univ. Calif. Publ. Bot. 15: 288. 1929 — North Borneo.
5. *myriocarpa* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 296. 1937 — West Borneo.
24. *palawanensis* Brem. n. spec. — Palawan.
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var. *Merrillii* Brem. n. nom. — Palawan.
platyphylla Merr. in Univ. Calif. Publ. Bot. 15: 288. 1929 = *glabra*.
16. *polyantha* Khs. in Ned. Kruidk. Arch. 2 (2): 246. 1851 — West Sumatra and perhaps Malay Peninsula (hirta Ridl.).
puberula Merr. in Papers Mich. Acad. Sci. 23: 195. 1938 = *microcarpa*.
pubescens Ridl. in Jour. As. Soc. Straits 57: 63. 1911 — Malay Peninsula — species incertae sedis.
17. *scabridula* Brem. n. spec. — East Sumatra.
1.* *tortilis* (Bl.) Khs. in Ned. Kruidk. Arch. 2 (2): 246. 1851 (Psychotria Bl.) Java, West Sumatra.
var. β Khs. l.c. — West Sumatra — incertae sedis.
9. *undulata* Khs. op. cit. 247; interpr. Val. in Engl., Bot. Jahrb. 44: 568. 1910 — South-east Borneo.
21. *urticina* Stapf in Trans. Linn. Soc. Ser. 2, Bot. 4: 182. 1894 — North Borneo.
var. *glabrescens* Brem. n. var. — North Borneo.
var. *Stapfii* Brem. n. nom. — North Borneo.
Wallichii Merr. in Papers Mich. Acad. Sci. 23: 194. 1938, n. nom. illeg. — *microcarpa*.

Streblosa species etiam sub nomine generico Psychotria cognitae.

Psychotria singalensis Miq., Fl. Ind. Bat. 2: 294. 1857, n. nom. = *Streblosa polyantha* Khs.
Psychotria tortilis Bl., Bijdr. Fl. Ned. Ind. 958. 1826 = *Streblosa tortilis* (Bl.) Khs.
Psychotria undulata (Khs.) Miq., Fl. Ind. Bat. 2: 294. 1857, n. comb. (non Poir., Encycl. Suppl. 4: 591. 1816, sphalm. = *P. undata* Jacq., Hort. Schoenbr. 3: t. 260. 1798) = *Streblosa undulata* Khs.

ZEIST,
HOLLAND.

A MONOGRAPH OF THE GENUS POMAZOTA RIDLEY (RUBIACEAE)

C. E. B. BREMEKAMP

INTRODUCTION

THE IDENTITY OF COPTOPHYLLUM KHS. AND POMAZOTA RIDL. CHOICE OF THE TYPE SPECIES

POMAZOTA Ridl. was based on a plant collected in the Malay Peninsula. The valvate aestivation of its corolla-lobes, the dehiscent fruit and numerous angular and alveolate seeds prove that it belongs to the Hedyotideae. Ridley's plant shows a striking resemblance to the species of the genus *Coptophyllum* Khs., but Ridley was of opinion that it differs from them in the nature of its fruits. Those of *Pomazota* are stated to open by a lid, whereas those of *Coptophyllum* are assumed to be indehiscent. Ridley's idea of the fruits of the latter, however, was apparently based on a somewhat superficial study of the literature. It is true that both in Bentham & Hooker's "Genera Plantarum" and in Schumann's monograph of the family in Engler & Prantl's "Natürliche Pflanzenfamilien" the genus is reckoned to the Mussaendeae, i.e. to a tribe in which the fruits are said to be indehiscent, but Korthals himself had been less positive, for he had described the fruit (in Ned. Kruidk. Arch. 2 (2): 161. 1851) as "capsula membranacea indehiscens (?) bilocularis." That the interrogation mark in this sentence belongs to "indehiscens" and not to "bilocularis" need not be doubted. Whether the septum of a bilocular ovary persists or disappears in the ripening fruit is taxonomically, as a rule, but of little importance, and if Korthals had felt the slightest uncertainty on this point, he certainly would have preferred to pass on without mentioning the number of fruit-cells. Moreover, Bentham & Hooker, as well as Schumann, and Ridley also, had apparently overlooked Miquel's description of *Coptophyllum? capitatum* (Fl. Ind. Bat. 2: 348. 1857), the species quoted by Ridley in his "Flora of the Malay Peninsula," for Miquel described the fruits of this plant as "capsulae vertice apertae."

As the fruits of *C. pilosum*, the second species described by Miquel (in Ann. Mus. Bot. Lugd.-Bat. 4: 230. 1869), open in the same way as those of *C. capitatum*, and as up to now no further species of this genus have been made known, we may safely conclude that the difference in the nature of the fruits on which Ridley had based his generic distinction, is in reality non-existent. Moreover, as the real differences existing between the species of *Coptophyllum* and *Pomazota* are all found to be of minor importance, it is clear that the two genera must be considered identical.

A difficulty to the view here brought forward lies in the fact that

Korthals' generic description deviates in two points from that given below, the corolla being described as naked inside and the calyx-lobes as oblong. Another objection might be found in the obtuse stipules mentioned in the description of the type-species, but these incongruities should not be taken too seriously. The oblong calyx-lobes offer no difficulty at all, for calyx-lobes of this shape really occur in some of the species, but as they can not be considered a general feature of the genus, they could, of course, find no place in my description. A corolla naked inside and obtuse stipules, however, occur in none of the species below referred to *Pomazota*, and their presence in the type-species of *Coptophyllum*, therefore, would form a serious obstacle to my view of the identity of the two genera. This obstacle can only be overcome by assuming that the observations of Korthals were incorrect. Mistakes of this kind may easily come about when the material is incomplete and in a bad condition. The ring of spreading hairs in the upper part of the corolla-tube, although a very striking feature in the fully developed flower, is easily overlooked when the flowers are still in bud, for these hairs are at first firmly pressed against the wall. The sharp points of the stipules may pass unnoticed, because they are easily broken off: it is quite conceivable that they may have been absent in Korthals' specimens. As the latter are lost, the question of their generic position can not be settled with absolute certainty, but as the rest of Korthals' description agrees well with that given below, e.g., in the very characteristic shape of the stigmata, and as we know no other genus which fits the description equally well, there is apparently no reason to regard *Coptophyllum* as a "genus dubium" or to doubt its identity with *Pomazota*. However, as the name *Coptophyllum* Khs. (in Ned. Kruidk. Arch. 2 (2): 161. 1851) is a later homonym of *Coptophyllum* Gardner (in Hook., Ic. Pl. 5: t. 477, 478. 1842), it can not be retained, and is to be replaced by *Pomazota* Ridl. (in Trans. Linn. Soc. Bot. II 3: 308. 1893).

When an older generic name is rejected in favour of a more recent one, the question arises as to which species should be regarded as the type. It can obviously be solved in either of two ways, for our choice depends on what we consider more important: the connection with the name which is to be retained or that with the taxonomic conception which found its first expression in the rejected name. The "International Rules of Botanical Nomenclature" give us no guidance. It is true that Art. 5 says: "In the absence of a relevant rule or where the consequences of rules are doubtful, established custom must be followed," but as the type-method is still comparatively young, one can in this case hardly speak of "established custom." On an earlier occasion (in Jour. Arnold Arb. 21: 34. 1940), when the type of the genus *Urophyllum* Wall. had to be fixed, I chose the second alternative, because it appeared to me that the taxonomic conception should be considered more important that a mere name. As type of the genus *Urophyllum* Wall. I therefore chose *U. arboreum* (Reinw. ex Bl.) Khs. This species namely is the type of the genus *Wallichia* Reinw. ex Bl., and *Wallichia* Reinw. ex Bl. is the name under which the taxonomic

conception now known as *Urophyllum* Wall. was first put forward. If the same rule is to be applied in the present case, the type will have to be looked for among the species originally referred to *Coptophyllum* Khs. This, however, offers a new difficulty.

The genus *Coptophyllum* Khs. was based on a plant collected on Mt. Singalang in Western Sumatra. It was described under the name *C. bracteatum* Khs. Under ordinary circumstances this species, of course, should be regarded as the type, but unfortunately its identity is not fully certain. As stated above, the specimens on which it was based are lost, and the description is not sufficiently detailed to allow its identification. Apart from its occurrence in the Uplands of Padang, there are but two points in the description which might give us a clue: the oblong calyx-lobes and the presence of stiff hairs on the upper side of the leaves. More or less oblong calyx-lobes are found in *Pomazota assimilis* Brem. n. spec., a near ally of *Coptophyllum capitatum* Miq., and also in *Pomazota rivularis* Hend. and the nearly related *P. scabiosiflora* Brem. n. spec. and *P. batuensis* Brem. n. spec. The two last-named species need not be taken into consideration, for in *P. scabiosiflora* the leaves are glabrous on the upper side and *P. batuensis* has not yet been found outside the Batu Islands. *Pomazota assimilis* and *P. rivularis* fit Korthals' description almost equally well, and as both are known to occur in the mountains of Sumatra, it is impossible to make a choice; moreover, Korthals' species may have been different from both. Therefore, as *Coptophyllum bracteatum* Khs. can not be identified with certainty, it can not be accepted as the type of the genus, and we will have to fix our choice on the species which comes next in age. This is *C. capitatum* Miq. Miquel was apparently at first not fully convinced that this species belonged to *Coptophyllum* Khs., for in the original description he put an interrogation mark behind the generic name, but this was dropped in his paper on the Rubiaceae of the Malay Archipelago in Ann. Mus. Bot. Lugd.-Bat. 4: 1869.

It is a rather curious coincidence that the genus had also drawn Blume's attention. Among the unclassified Rubiaceae of the Utrecht Herbarium I found a specimen of *Pomazota pilosa* (Miq.) Brem. n. comb. (*Coptophyllum pilosum* Miq.) which had been collected by Kühl and van Hasselt at the Tji Djralang in S. W. Bantam. The collectors, who regarded it as an *Argostema*, had provided it with a short diagnosis, but the really interesting point of the specimen is that it also bore a label in Blume's handwriting with the name "*Lasiagathis humilis* Bl." The genus *Lasiagathis*, however, has never been published.

THE TAXONOMIC POSITION OF THE GENUS

As I have already pointed out in my paper "On Urophyllum Wall. (Rubiaceae) and its nearest allies" (in Rec. Trav. Bot. Néerl. 37: 171. 1940), the distinction between the tribes Hedyotideae, or Oldenlandieae

as they are called by Schumann, and Mussaendeae, which rests merely on the dehiscence or indehiscence of the fruits, can not be kept up. "If the two tribes, Hedyotideae and Mussaendeae," I wrote, l.c., "are united, the bulk of the genera at present included in them, form a natural group, characterized not only by the pluri-ovular ovary cells and the valvate aestivation of the corolla lobes, but also by the axile or nearly axile, peltate or subpeltate placentation and by the ovoid or angular, yellowish, reddish or brown, more or less distinctly alveolate, striate or punctate seeds. Genera in which some of these characters are wanting, for instance those with a clávate or columnar placenta and smooth seeds, should be excluded." With these misplaced genera I reckon, among others, *Schradera* Vahl, the twin genera *Coccocypselum* [P. Br.] Sw. and *Lipostoma* D. Don, *Tammsia* Karst., which probably belongs to another family, *Carphalea* Juss., *Dirichletia* Klotzsch, *Placopoda* Baill., *Payera* Baill., *Jackia* Wall., *Cruikshankia* Hook. and the two genera *Carlemannia* Benth. and *Sylvianthus* Hook. f., which do not belong to the Rubiaceae but should find a place in the vicinity of the Caprifoliaceae.

Among the genera which are left in the tribe two smaller groups have already been recognized. One comprises *Urophyllum* Wall. and the nearly allied genera *Antherostele* Brem., *Didymopogon* Brem., *Maschalocorymbus* Brem., *Pravinaria* Brem., *Praravinia* Khs., *Rhaphidura* Brem., *Leucolophus* Brem., *Lepidostoma* Brem., *Pleiocarpidia* K.Sch. and *Stichianthus* Val., characterized by the axillary position of the inflorescences, dioecious flowers, a pluri-locular ovary, paired, at first nearly axile placentas, which, when the fruit begins to swell, shift towards the middle of the radiating septa, stamens or staminodes inserted at or near the mouth of the tube and more or less distinctly spreading stigmata. Another group consisting of *Sabicea* Aubl. and its allies: *Pauridiantha* Hook. f., *Pamplethantha* Brem., *Stelechantha* Brem., *Commitheca* Brem., *Poecilocalyx* Brem., *Rhipidantha* Brem., *Temnopteryx* Hook. f. and *Pentaloncha* Hook. f., all provided with heterostylous flowers, a 2-, 4- or 5-locular ovary whose cells are in the upper half divided by false septa, axile placentas which, as the false septa penetrate in them for some distance, are more or less obcordate, stamens which at least in the long-styled flowers are inserted in the middle of the tube, and more or less cohering stigmata. A third group, formed by *Mussaenda* L. and some other genera, is characterized by a curious form of heterostyly, the long-styled flowers being female and the short-styled ones male; the genera belonging to this group, however, have not yet been sufficiently studied. Still less is known of the remaining ones, and for this reason the position of the genus *Pomazota* Ridl. can not yet be satisfactorily ascertained.

The most important characters of *Pomazota* appear to be the stiff hairs present on all the young parts but especially conspicuous along the margin of the leaves, stipules, bracts and calyx-lobes and also on the midrib of the corolla-lobes, the terminal capituliform inflorescence with its 4, 5 or 8 involucral bracts, the presence of a hair-ring in the upper part of the

corolla-tube, the insertion of the stamens at or below the middle of the tube, the short and thick, rectangularly spreading stigma-lobes, always protruding beyond the anthers and the ring of hairs in the corolla-tube, and finally the globose capsule which in the end opens by the disintegration of a cell-zone at the base of the calyx, after which the upper part including the calyx and the rather conspicuous disk is thrown off in the form of a lid.

The nearest approach to these characters is found in the genus *Klossia* Ridl. Its only species is a nearly glabrous, thin leaved plant, which at first sight looks rather unlike the hirsute *Pomazota* species. In reality, however, it differs from the latter in minor points only. Its inflorescences are somewhat less strongly condensed, the bracts being smaller and the flowers distinctly pedicellate, the bracts and the rather large, in the bud overlapping, calyx-lobes are eciliate, the stamens inserted a little way above the middle of the tube and provided with papillate instead of glabrous filaments, and the stigmata are obovate and flattened and remain attached to each other. The corolla-tube, however, is provided at the upper end with a ring of hairs, and the fruits open with a lid. The disintegration-zone on the other hand, lies inside, not outside the calyx, so that the latter persists on the open fruit.

Some other genera belonging to this tribe resemble *Pomazota* in the nature of the inflorescence. They are *Siderobombyx* Brem., a new genus to be described hereafter, *Keenania* Hook. f., *Campanocalyx* Val., *Myrioneuron* R.Br., *Polysolenia* Hook. f., *Leptomischus* Drake, *Mouretia* Pitard and *Lucinaea* DC. None of them, however, appears to be a close ally.

The only species of *Siderobombyx* shows a strong resemblance to *Pomazota*. Its large ovate acuminate stipules are indistinguishable from those of the latter; its inflorescences are terminal and capituliform, and, in the same way as in some of the *Pomazota* species, soon pushed aside by a branch arising from the axil of one of the two highest leaves; the capitula moreover are surrounded by large bracts, and the calyx-lobes are, like those of *P. capitata* and *P. assimilis*, densely hairy. The hairs themselves, however, are of a different kind; the young leaves are not covered with stiff rust-brown hairs like those of the *Pomazota* species, but with the same silky reddish brown pubescence which gives the young leaves in the genus *Xanthophytum* Reinw. ex Bl. and in the nearly related and perhaps not sufficiently distinct genera *Paedicalyx* Pierre ex Pitard and *Xanthophytopsis* Pitard their peculiar lustre. The hairs on the bracts and calyx-lobes too are soft and thin like those covering the young leaves and not stiff like those of the *Pomazota* species. This, however, is by no means the only difference. The capitula are not surrounded by 4, 5 or 8 ovate, oblong or spathulate bracts, but by two very large reniform ones; the corolla-tube is not provided with a ring of hairs near its upper end, but the whole upper half is densely villous on the inside, and the fruit is not a capsule opening by a lid, but a dipyrenous drupe. In the only specimen which could be studied the filaments, moreover, proved to be

much shorter than in the *Pomazota* species, whereas the clavate style was longer; the latter proved to be shortly two-lobed. The shortness of the filaments and the comparatively great length of the style suggest that the specimen represents the long-styled form of a dimorphic species.

In the genera *Keenania* and *Myrioneuron* too the flowers are apparently heterostylous, but the heterostyly is here probably combined with dioecism. The type-species of the genus *Keenania* at least was based on a specimen with sterile anthers, and of the flowers of *K. ophioglossoides* Drake and *K. tonkinensis* Drake figured by Pitard in Lecomte, Fl. Gén. Indo-Chine 3: f. 16 (8, 9), the first are long-styled and maybe female, whereas the second are short-styled and, as the stigmata seem to be rudimentary, probably male. As the description of the vegetative parts of these two species do not reveal appreciable differences, it is not impossible that they are conspecific. Similarly the description of *Myrioneuron tonkinense* Pitard (op. cit. 193) appears to be based on a male specimen and that of *M. pubiflorum* Pitard (ibid.) on a female one. The fruits of *Myrioneuron* are exsuccous dipyrenous drupes whose pyrenes open ultimately on the inner side; the fruits of *Keenania* are unknown. *Campanocalyx* apparently comes very near to *Keenania*, from which it differs, however, conspicuously by its campanulate calyx; its floral mechanism being as yet incompletely known.

Polysolenia is very imperfectly described, but it seems to me that this genus too is heterostylous, the type-specimen representing the short-styled form. At any rate, as its stamens are inserted in the upper part of the tube and overtop the style, the genus is apparently no near ally of *Pomazota*. Its fruits are unknown. The description of *Leptomischus* Drake, whose fruits open in the same way as those of *Pomazota* and *Klossia*, does not differ very much from that of *Polysolenia*, and I therefore consider these two genera closely related. In *Mouretia* Pitard too the stamens are inserted in the upper part of the tube. As the floral mechanism of all these genera is quite different from that found in *Pomazota* and *Klossia*, they are apparently not very nearly allied to them.

The capitula of *Lucinaea* are naked and therefore not readily comparable to those of *Pomazota* and *Klossia*. In its truncate calyx and thick, smooth testa the genus differs moreover so considerably from the other members of the tribe that its inclusion in it seems hardly justified.

Capsules opening in the same way as those of *Pomazota* and *Klossia* are found in *Argostema* Wall. In the shortness of the corolla-tube and in the syngenesious anthers this genus, however, possesses characters which give it a rather isolated position in the tribe. Perhaps of more importance are the points of resemblance between *Pomazota* and *Klossia* and the genus *Ophiorrhiza* L., whose capsules are also apically dehiscent. The partial inflorescences are cymose like those of the two first-named genera; the stamens are inserted in the lower half of the tube and the style overtops the anthers. However, as none of these characters are confined to these genera, their value should not be overrated.

Pomazota reptans Backer ex Brem. seems at first sight to differ essentially from the other species by its decumbent and creeping shoots and the small size of its leaves and capitula. A more detailed analysis, however, does not corroborate this view, for important points of difference are not brought to light. The resemblance in the vegetative parts of the other species is very strong indeed. *Pomazota Vanleeuweni* Brem. is recognizable by its small size and by the scabridity of the upper side of the leaves, *P. scabiosifolia* Brem. by its leaves, glabrous on the upper side, and *P. simalurensis* Brem. by its pseudo-dichotomy, but the vegetative parts of the six remaining species are almost indistinguishable. The ovate-acuminate stipules end in an undivided tip in eight of the ten species recognized in this paper, in *P. simalurensis* and *P. scabiosiflora* in two fairly long, parallel teeth.

With regard to the position of the inflorescences the ten species form two easily distinguishable groups. In the first there is never more than a single inflorescence at a node, whereas in the second the majority are found in pairs. In the second group the peduncles are moreover always provided with a pair of scales at the base, whose median position proves them to be the stipules belonging to a pair of suppressed leaves; in the first group these scales are always wanting. Their presence proves that the inflorescences in the second group are not really axillary, as they might seem at first sight, but that they are borne by axillary brachyblasts consisting of a single, very short internode; in reality they are terminal. In the first group too the inflorescences are terminal, but here they are found at the end of an ordinary leafy shoot. They are, however, soon overtopped by one or, rarely, two innovation-shoots developing from the axil of one of the two highest leaves or of both of them. If a single shoot develops, the inflorescence becomes pseudo-axillary, the innovation-shoot forming the continuation of the main shoot. The stems of these plants, therefore, are sympodia. If two innovation-shoots develop (*P. simalurensis*), the plants become pseudo-dichotomously branched. Another difference between the two groups is found in the structure of the capitula. In the first group the flowers are, at least in the axils of the outer bracts, arranged in triads or in several-flowered cymes, whereas in the second group they are always solitary.

The involucre consists of 4, 5 or 8 bracts, which differ but slightly from the inner ones. Tetramerous and pentamerous involucres occur in both groups, but the octamerous ones are confined to the first. In the first group the bracts of the tetramerous involucres are decussate, but those of *P. rivularis*, the only species of the second group in which the involucre is tetramerous, form a whorl, and are found to alternate with the four immediately following inner ones; in the pentamerous involucres the arrangement looks at first sight to be quincunxial, but here too the involucral bracts alternate with the adjoining inner ones. The octamerous

involucres consist of 4 larger bracts alternating with 4 smaller ones, but the morphological value of the latter is not always the same. In *P. simalurensis* the four larger bracts are decussate, and each of them subtends a cyme. The bracts subtending the branchlets of the two lower cymes are conduplicate and twisted at the base so that the upper part lies more or less in the same plane as the main bract: these two pairs of lateral bracts form the smaller bracts of the involucre. In *P. assimilis* Brem. and *P. capitata* (Miq.) Brem. the eight involucral bracts are united at the base, and they all subtend cymes. Those subtended by the four larger ones form an outer circle, those belonging to the four smaller ones recede a little towards the centre. All the cymes, however, are strongly dorsiventral, some of the bracts being larger than the others and shifted to the outside. The involucral bracts themselves may therefore easily be taken for sterile, for when they are removed, a complete circle of smaller bracts is revealed behind which the flowers are hidden. There is, therefore, an important difference between these species and *P. simalurensis* in the arrangement of the involucral bracts. Whereas the arrangement in the latter is strictly decussate, that of the involucral bracts of *P. assimilis* and *P. capitata* is to be regarded either as quaternate or as a somewhat modified form of the $\frac{3}{8}$-phyllotaxis. The occurrence in the same genus of a somewhat modified quincunxial arrangement forms an argument in favour of the latter supposition.

The capitula of *P. reptans*, *P. Vanleeuweni* and *P. simalurensis* contain inside the involucre but one or two pairs of main bracts; the number of flowers in these capitula is accordingly but small. In *P. assimilis* and *P. capitata* the number of main bracts inside the involucre is difficult to determine, but it is probably not larger than in the species just mentioned. Owing to the large number of flowers in each of the cymes, the total number is nevertheless very considerable, larger in fact than in any other species of this genus. In the five remaining species the inner bracts form a dense rosette. In *P. assimilis* the first lateral bracts of the outer cymes are at the base on each side provided with a patent lobe. In the nearly related *P. capitata* these lobes are usually absent; occasionally, however, a single one may be present. The involucral bracts of *P. sylvestris* Ridl. and *P. pilosa* (Miq.) Brem. are carinate, the five keels forming a prominent feature of the involucre.

In *P. assimilis*, *P. capitata* and *P. sylvestris* all bracts subtend cymes. In the other species belonging to the first group the outer bracts subtend pentads or triads, whereas in the axils of the inner ones the cymes are reduced to paired or single flowers; in *P. reptans* the cymes are occasionally all reduced in this way. In the second group the flowers are always solitary in the axils of the bracts, but the presence of a pair of bracteoles at the base of each flower proves that the latter represents a cyme.

In the first group the cymes are sometimes shortly stipitate, the stipe being partly or entirely fused with the subtending bract; the flowers, on the other hand, are always sessile. In the second group, where the cymes

are reduced to single flowers, the stipe is always fused with the stalk-like base of the bract; in *P. rivularis* the flowers themselves are shortly pedicellate, i.e. in this species there is a distinct internode between the bracteoles and the base of the ovary.

The calyx-lobes are ovate-orbicular in *P. pilosa*, ovate-lanceolate in *P. reptans*, *P. Vanleeuweni*, *P. sylvestris* and *P. simalurensis*, oblong in *P. rivularis*, *P. scabiosiflora* and *P. batuensis*, linear-oblong in *P. assimilis*, and linear in *P. capitata*. In the two latter species they are inside and outside densely hirsute; in the other ones ciliate.

In the species of the second group and in *P. reptans* the ovary and capsule are glabrous; in the other species of the first group they are always pilose.

KEY TO THE SPECIES

1. Inflorescences either solitary at the nodes or in the forks of a pseudo-dichotomously branched stem; the youngest inflorescence at the end of the shoot. Base of the peduncle never provided with scales. Flowers at least in the axils of the outer bracts in cymes or triads.....2.
: Inflorescences usually opposite and always lateral. Base of the peduncle always provided with a pair of stipular scales. Flowers always solitary in the axils of the bracts.....8.
2. Involucral bracts either 4 or 8.....3.
: Involucral bracts 5.....7.
3. Involucral bracts 4. Leaves not more than 6 cm. long.....4
: Involucral bracts 8. Leaves much longer.....5.
4. Shoots decumbent. Leaves ovate-elliptic or elliptic, acute or suddenly contracted at the base, on the upper side sparsely hirsute and not more than 4 cm. long. Inflorescences subsessile. Ovary and capsule glabrous. — South Sumatra and West Java — .....1. *P. reptans* Backer ex Brem.
: Shoots erect. Small, not more than 7 cm. high herb. Leaves lanceolate-elliptic, cuneate at the base, on the upper side scabrid, 4–6 cm. long. Inflorescence pedunculate. Ovary and capsule pilose. — East Sumatra — ....2. *P. Vanleeuweni* Brem.
5. Pseudo-dichotomously branched plant. Tip of the stipule bipartite. Involucral bracts free, the 4 larger ones decussate, each of them subtending a cyme; the two pairs of smaller ones representing the first pairs of bracts of the cymes subtended by the lower pair of involucral bracts. — Simalur (Simeulowe) — .....3. *P. simalurensis* Brem.
: Sympodial plants. Tip of the stipule undivided. Involucral bracts united at the base in a flat receptacle, all subtending cymes.....6.
6. Bracts subtending the branchlets of the cymes at the base on each side with a patent lobe. Calyx-lobes not more than 3 mm. long, covered with terrugineous hairs. — Sumatra and the islands to the west of it — .....4. *P. assimilis* Brem.
: Bracts never with two and rarely with a single lateral lobe. Calyx-lobes at least 5 mm. long, covered with grey hairs. — Northwestern Sumatra — ....5. *P. capitata* (Miq.) Brem.
7. All flowers cymose. Bracts all ovate; those of the inner flowers shorter than the corolla. — Malay Peninsula and Sumatra — .....6. *P. sylvestris* Ridl.
: Flowers in the axils of the outer bracts in triads; in the axils of the inner ones solitary. Bracts oblong to spathulate, those on the main axis always longer than the corolla. — West Java — .....7. *P. pilosa* (Miq.) Brem.
8. Involucral bracts 4. Flowers pedicellate. — Malay Peninsula, Sumatra, Borneo — .....8. *P. rivularis* Hend.
: Involucral bracts 5. Flowers sessile.....9.

9. Leaves on the upper side glabrous. Tip of stipule bipartite. Inner bracts spathulate. — Sumatra — .....9. *P. scabiosiflora* Brem.
: Leaves on the upper side sparsely hirsute. Tip of stipule undivided. Inner bracts linear. — Batu Islands — .....10. *P. batuensis* Brem.

TAXONOMY[1]

Pomazota Ridl. in Trans. Linn. Soc. II, 3: 308. 1893; K. Schumann in Engl. & Prantl, Nat. Pflanzenfam., Nachtr. 1: 310. 1897; Ridl. in Fl. Mal. Pen. 2: 43. 1924; Lemée, Dict. Pl. Phan. 5: 502. 1934.

Coptophyllum Khs. in Ned. Kruidk. Arch. 2 (2): 161. 1851; Miq., Fl. Ned. Ind. 2: 175, 348. 1857, Suppl. 226. 1860, in Ann. Mus. Bot. Lugd.-Bat. 4: 230. 1869; Benth. & Hook. f., Gen. Pl. 2: 68. 1871; Boerl., Handl. Fl. Ned. Ind. 2 (1): 57. 1891; Ridl., Fl. Mal. Pen. 2: 43. 1923; Lemée, Dict. Pl. Phan. 2: 297. 1930; non *Coptophyllum* Gardner in Hook., Ic. Pl. 5: t. 477, 478. 1842.

Genus Rubiacearum Hedyotidearum, corollae tubo intus paulum infra orem annulo pilorum instructo, stylo antheras excedente, capsula globosa cum operculo dehiscente ad Klossiam Ridl. accedens, indumento hirsuto, staminibus dimidio inferiore tubi insertis, filamentis glabris, stigmatibus patentissimis, calyce cum operculo deciduo ab eo faciliter distinguendum.

Herbae e basi breviter repente ascendentes, simplices vel parce ramosae, raro post anthesin decumbentes et radicantes, semper pilis septatis plus minusve hirsutae. Caulis nunc monopodialis, casu quo inflorescentiae ramulos oppositos breves, ex internodio singulo constantes et foliis ad stipulas redactis instructos terminantes, nunc dichasialiter ramificatus vel sympodialis, casu quo inflorescentiis primum terminalibus, deinde in positionem lateralem coactis et inde ad nodos solitariis. Folia petiolata: superiora tamen interdum subsessilia; lamina tenuis vel raro rigidula, penninervia. Stipulae interpetiolares, ovatae, acuminatae, apice interdum bipartito, margine ciliato, persistentes. Inflorescentiae plerumque longius pedunculatae, raro subsessiles, nunc primum terminales et deinde a ramo axillari in positionem lateralem coactae vel, cum duo rami evolvuntur, in furcis ramorum remanentes, nunc ramulos abbreviatos axillares terminantes, casu quo plerumque oppositae et basi pedunculi semper squamis duabus stipulaceis instructae, capituliformes. Bracteae ciliatae, estipulatae, axilla glandulis aliquibus baculiformibus instructae; exteriores 4, 5 vel 8 aliis latiores, capitulum involucrantes; omnes fertiles et nunc cymas bi- vel uniparas vel triades, nunc flores singulos bibracteolatos suffulcientes. Flores sessiles vel breviter pedicellati, hermaphroditi, pentameri quanquam interdum cum aliquibus tetrameris vel hexameris mixti. Ovarium biloculare, placentis medio septo affixis, peltatis, ovulis numerosis. Calyx tubo plerumque brevi, lobis ovatis, ovato-lanceolatis, oblongis vel linearibus, margine ciliatis, alternantibus cum glandulis baculiformibus, fructu diu persistens, ultimo tamen cum operculo deciduus. Corolla alba, luteola vel carneola, hypocrateriformis, parva, tubo interdum paulum inflato, infra orem plus minusve annulatim constricto et ibidem intus annulo pilorum patentium instructo, ceterum glabro, lobis ovatis acutis, flore aperto patentibus, costa extus ciliatis. Stamina ad medium

[1] The abbreviations for the herbaria of the institutions cited in this paper are as follows: AA = Arnold Arboretum; BZ = Buitenzorg Botanic Garden; HBG = Inst. Allg. Bot., Hamburg; K = Royal Botanic Gardens, Kew; NY = New York Botanical Garden; U = Bot. Mus. Utrecht.

vel infra medium tubum inserta, filamentis glabris, antheris linearioblongis, subbasifixis, apiculatis, plerumque inclusis. Discus annularis, conicus vel cylindricus, glaber vel farinosus. Stylus apicem versus vix conspicue papillosus, ceterum glaber, tubo subaequilongus vel eo paulo longior; stigmata crassa et brevia, basi patentissima, apice paulum recurvata. Fructus capsula globosa, disco conspicue rostrata et calyce coronata, pariete tenui, ultimo dimidio superiore tabescens et partem apicalem cum calyce et disco operculi instar rejectans. Semina numerosa, rubro-brunnea, angulosa, alveolata, alveolis fundo granulatis.

Distributum speciebus adhuc notis 10 in Peninsula Malayana, Sumatra, Java, terra Borneënsi.

LECTOTYPUS: *P. capitata* (Miq.) Brem. n. comb. (*Coptophyllum* Miq.).

SERIES A. Sympodiales

Inflorescentiae primum terminales, plerumque mox a ramo axillari in positionem lateralem coactae, interdum, cum rami axillares duo evolvuntur, in furca ramorum remanentes. Pedunculus basi numquam squamis stipulaceis instructus. Flores axillis bractearum pro parte minime in cymas vel triades dispositi (in P. reptante interdum omnes singuli). Species 1–7.

a. Bracteae involucrantes 4.

a. Herba decumbens, foliis ovato-ellipticis vel ellipticis parvis, inflorescentia subsessili parva, ovario capsulaque glabris.

1. **Pomazota reptans** Backer in sched.; TYPUS: *Backer 31142* (BZ).

Herba ramosa, partibus apicalibus primum ascendentibus, usque ad 12 cm. altis, post anthesin decumbentibus et radicantibus. Caules 1.2 mm. diam., densius fusco-pubescentes, vivo rubri. Folia petiolo pubescente, 3–15 mm. longo, vivo rubro instructa; lamina elliptica vel ovato-elliptica, 2.5–4 cm. longa et 1.3–2.2 cm. lata, apice acuta vel breviter acuminata, basi acuta vel rotundata, casu quo prope petiolum contracta, sicc. supra saturate, subtus dilute brunnea, supra sparse fusco-hirsuta, subtus costa nervis venulis dense fusco-pubescens, margine ciliata, nervis utroque latere costae 7 vel 8, venulis paucis. Stipulae 4–5 mm. longae et 3–4 mm. latae, apice indivisae, margine ciliatae, ceterum glabrae. Inflorescentia subsessilis, a ramo axillari mox in positionem lateralem coacta, 8–12 mm. diam. Bracteae involucrantes 4, decussatae, ellipticae vel obovatae, 6–9 mm. longae et 4–6 mm. latae, margine ciliatae; bracteae interiores 2 vel 4, spathulatae, exterioribus aequilongae; omnes extus intusque fusco-hirsutae. Bracteae involucrantes plerumque pemptades vel triades, raro cymas ad flores duos vel singulos redactas suffulcientes, floribus ultimis pemptadum tamen plerumque rudimentariis; cymae in axillis bractearum interiorum semper ad flores duos vel ad florem singulum redactae. Bracteae florum lateralium pemptadum vel triadum spathulatae, basi conduplicatae, 4 mm. longae; bracteae florum sequentium et bracteolae florum singulorum eis angustiores, 2–2.5 mm. longae. Flores 5-meri. Ovarium glabrum. Calyx lobis ovatis, 0.7–1.3 mm. longis et 0.4–0.5 mm. latis, subobtusis, margine ciliatis sed ceterum glabris. Corolla alba tubo 3.5 mm. longo, 1.2 mm. infra orem annulo pilorum instructo, lobis 1–1.5 mm. longis. Stamina 0.5 mm. supra basin tubi inserta, filamentis 2.3 mm.,

antheris 0.8 mm. longis. Discus cylindricus, 0.5 mm. altus. Stylus 4 mm. longus. Capsula glabra, 1.5 mm. diam.

Hab. Sumatram Australem et Javam Occidentalem.

SUMATRA: Lampongs: G. Rate Telangaran, *Ibut 24* (BZ); G. Tanggamus, alt. 700 m., *de Voogd 161* (BZ). JAVA: Res. Buitenzorg: Lewiliang, alt. 500 m., *v. Steenis 2717* (BZ); G. Parungpung near Tjampea, alt. 750 m., *Bakhuizen v. d. Brink 4174* (BZ); ibid., *Bakhuizen v. d. Brink Jr. 610* (U); Kalapa Nunggal, alt. 200 m., *Backer 23381* (BZ); ibid., alt. 400 m., *Backer 5992* (BZ); ibid., alt. 500 m., *Backer 31142* (BZ, TYPUS).

Specimina sumatrana a me nondum visa fide *Backer* (in litteris) citata sunt.

β. Herba erecta, foliis lanceolato-ellipticis, supra scabridis, inflorescentia pedunculata, ovario capsulaque pilosis.

2. **Pomazota Vanleeuweni** Brem. n. spec.; TYPUS: *Docters v. Leeuwen 3276* (BZ).

Herba erecta, simplex, 5–7 cm. alta. Caulis densius pubescens, 2–2.5 mm. diam. Folia in petiolum dense pubescentem, 2–5 mm. longum contracta; lamina lanceolato-elliptica, 4–6 cm. longa et 1.6–2.7 cm. lata, apice acuta, basi contracta et plus minusve conduplicata, rigidula, sicc. supra saturate et subtus dilute brunnea, supra setulis minimis scabrida, subtus molliter pubescens, costa utrimque et nervis subtus dense pubescentibus, margine ciliolata, nervis utroque latere costae 10–13, venulis inconspicuis. Stipulae 8 mm. longae et 7 mm. latae, apice indivisae, extus dense pilosae, margine ciliatae. Inflorescentia distincte pedunculata; pedunculus dense pubescens, post anthesin usque ad 3.5 cm. accrescens. Bracteae extus dense, intus sparse pubescentes, margine pilis similibus ciliatae; bracteae involucrantes 4, decussatae, jugi primi ovatae, 12 mm. longae et 11 mm. latae, jugi secundo angustiores, omnes cymas 5-floras suffulcientes; bracteae interiores duae, triades suffulcientes; bracteae florum lateralium conduplicatae, bracteis involucrantibus paulo breviores; bracteae ultimae praecedentibus dimidio breviores. Flores 5-meri. Ovarium pilosum. Calyx lobis ovatis, 0.5 mm. longis et 0.7 mm. latis, subacutis, extus pilosis, margine pilis similibus ciliatis. Corolla alba dicta a me non visa. Discus cylindricus, 1 mm. altus. Capsula pilosa, 2 mm. diam.

Hab. Sumatram Orientalem.

SUMATRA: East Coast Gouvt: Haboko, in the forest between stones on the bank of a stream, *Docters v. Leeuwen 3276* (BZ, TYPUS, dupl. L.).

b. Bracteae involucrantes 8, liberae. Cymae decussatae.

3. **Pomazota simalurensis** Brem. n. spec.; TYPUS: *Achmad 516* (BZ).

Herba e basi breviter repente ascendens, pseudo-dichotome ramificata, 15–40 cm. alta. Caulis primum densius pubescens, internodiis bisulcatis, deinde plus minusve glabrescens et subteres, 2.5–4 mm. diam. Folia in petiolum pubescentem, usque ad 4 cm. longum contracta; petiolus foliorum superiorum tamen usque ad 8 mm. redactus; lamina lanceolata vel oblanceolata, 6–12 cm. longa et 2.5–4.5 cm. lata, apice acuminata, basi cuneata, supra sparse hirsuta, costa tamen densius pubescens, subtus costa nervis venulis pubescens, margine ciliata, sicc. supra saturate, subtus dilute brunnea, nervis utroque latere costae circ. 13, venulis paucis. Stipulae 14–16 mm. longae et 6–7 mm. latae, apice plerumque in dentes duas parallelas, usque ad 4 mm. longas exeuntes, margine ciliatae, ceterum glabrae. Inflorescentiae pedunculatae; pedunculus dense hirsutus, ad anthesin circ. 1 cm. longus, postea usque ad 3 cm. accrescens; capitulum

2.5 cm. diam., post anthesin usque ad 3.5 cm. diam. accrescens. Bracteae involucrantes 8, quarum 4 majores triades breviter stipitatas suffulciunt; bracteae laterales triadum infimarum basi conduplicatae et torsae et inde in planum idem ut bractea triadem suffulciens expansae involucrum supplentes, bracteae involucrantes omnes liberae, spathulatae, ad medium plerumque contractae, extus basin versus pubescentes, margine ciliatae, majores 12 mm. longae et 5–6 mm. latae; bracteae interiores 4, ut bracteae involucrantes majores decussatae, flores singulos bibracteolatos suffulcientes; bracteolae ovatae, ovario paulo longiores. Flores 5-meri. Ovarium pilosum. Calyx lobis ovato-lanceolatis, 1.1 mm. longis et 0.5 mm. latis, extus sparse pilosis, margine ciliatis. Corolla matura nondum visa, colore ignoto. Stamina prope basin tubi inserta. Discus conicus, 0.5 mm. altus. Capsula pilosa.

Hab. insulam a Sumatra ad occasum Simalur sive Simeulowe dictam.

SIMALUR: s.l., *Achmad 516* (BZ, TYPUS, dupl. typi L).

c. Bracteae involucrantes 8, basi connatae. Cymae quaternae.

a. Bracteae cymarum primigenae basi utrimque lobo patente munitae. Calycis lobi minus quam 3 mm. longi, ferrugineo-hirsuti.

4. **Pomazota assimilis** Brem. n. spec.; TYPUS: *Loerzing 5880* (U).
Coptophyllum capitatum Miq. in errore apud Ridl. in Kew Bull. 1926: 68. 1926.

Herba e basi breviter repente ascendens, 13–20 cm. alta. Caulis simplex, primum dense ferrugineo-hirsutus, internodiis bisulcatis, deinde glabrescens et teres, 2.5–4 mm. diam. Folia in petiolum primum dense, deinde sparse hirsutum, 0.5–3.0 cm. longum contracta; lamina lanceolata vel oblanceolata, 7–13 cm. longa et 3.2–4.3 cm. lata, apice acuminata, basi acuta vel cuneata, supra sparse hirsuta, subtus costa nervis venulis principalibus densius ferrugineo-hirsuta, margine ciliata, sicc. supra olivaceo-brunnea, subtus dilute brunnea, nervis utroque latere costae 10–12, venulis paucis. Stipulae 10 mm. longae et 9 mm. latae, apice indivisae, margine ciliatae, ceterum glabrae. Inflorescentiae pedunculatae; pedunculus subglaber, post anthesin circ. 3 cm. longus. Bracteae involucrantes 8, quarum 4 majores; omnes oblongae; majores 15–17 mm. longae et 4–5 mm. latae, ad medium interdum plus minusve constrictae; minores 10–12 mm. longae sed majoribus subaequilatae; omnes basi in receptaculum 7–10 mm. diam. connatae, apice subacutae, primum utrimque densius pubescentes. Flores omnes in dichasia densa dispositi; dichasia extus bracteis majoribus instructa; bracteae primigenae basi utroque latere lobo patente munitae, 13 mm. longae, lobo mediano 4 mm. lato, lobis lateralibus 3 mm. longis et 3 mm. latis; bracteae sequentes sensim minores, plerumque sine lobis lateralibus; bracteolae florum ultimorum flori aequilongae. Flores 5-meri. Ovarium dense pilosum. Calyx lobis lineari-oblongis, 2.7 mm. longis et 0.3–0.4 mm. latis, extus intusque pilis ferrugineis dense hirsutis. Corolla alba tubo 3 mm. longo, paulum inflato, 0.3 mm. infra orem annulo pilorum instructo, lobis 1 mm. longis. Stamina 0.7 mm. supra basin tubi inserta; filamenta 0.9 mm. longa; antherae 0.9 mm. longae. Discus annularis, 0.3 mm. altus. Stylus 3.5 mm. longus. Capsula 2 mm. diam., pilosa.

Hab. Sumatram et insulas a Sumatra ad occasum.

SUMATRA: East Coast Gouvt: S.E. of Sibolangit, alt. 650 m., *Loerzing 5880* (U, TYPUS); Lan Betimus, N.W. of Sibolangit, alt. 350 m., *Loerzing 5318* (U); Bukit

Pasang near Sibolangit, *Mandur Nur 7246* (K); Res. Tapanuli, Padang si Dempuan, *Rahmat 4854* (NY). Batu Islands: P. Batu, *Raap 655* (BZ); P. Masa, *Raap 169* (BZ). Mentawei Islands. Siberut, *Ibut 194* (BZ); *Boden Kloss 14517* (K).

β. Bracteae cymarum primigenae basi interdum uno sed numquam duobus lobis patentibus instructae. Calycis lobi plus quam 5 mm. longi, griseo-hirsuti.

5. **Pomazota capitata** (Miq.) Brem. n. comb.
Coptophyllum? capitatum Miq., Fl. Ind. Bat. 2: 348. 1857, Suppl. 216. 1860.
Coptophyllum capitatum Miq. in Ann. Mus. Bot. Lugd.-Bat. 4: 230. 1869; Boerl., Handl. Fl. Ned. Ind. 2 (1): 128. 1891; vix Ridl. in Fl. Mal. Pen. 2: 43. 1923, quae probabiliter est *P. rivularis* Hend., non Ridl. in Kew Bull. 1925: 89. 1925, quae est *P. rivularis* Hend., nec op. cit. 68. 1926, quae est *P. assimilis* Brem.

Herba e basi breviter repente ascendens, circ. 20 cm. alta. Caulis simplex, primum dense ferrugineo-hirsutus, internodiis bisulcatis, deinde glabrescens et teres, 2.5–5 mm. diam. Folia in petiolum primum dense, deinde sparse hirsutum, 1.5–3.5 cm. longum contracta; lamina lanceolata, 10–16 cm. longa et 3.5–5.5 cm. lata, apice acuminata, basi acuta vel cuneata, supra sparse hirsuta, subtus costa nervis venulis principalibus densius ferrugineo-pubescens, margine ciliata, sicc. supra saturatius, subtus dilute brunnea, nervis utroque latere costae 11–13, venulis paucis. Stipulae 12 mm. longae et usque ad 15 mm. latae, apice indivisae, margine ciliatae, ceterum glabrae. Inflorescentiae pedunculatae; pedunculus subglaber, ante anthesin 1.5 cm. longus, postea usque ad 5 cm. accrescens. Bracteae involucrantes 8, quarum 4 majores, omnes oblongae; majores 20 mm. longae et 6–7 mm. latae; minores 15 mm. longae sed majoribus subaequilatae; omnes basi in receptaculum 10 mm. diam. connatae, apice subacutae, primum utrimque dense, deinde sparsius pubescentes. Flores omnes in dichasia densa dispositi; dichasia extus bracteis majoribus instructa; bracteae primigenae basi interdum lobo singulo munitae; bracteae sequentes floribus breviores; bracteolae florum ultimorum minimae. Flores 5- vel 6-meri. Ovarium dense pilosum. Calyx lobis linearibus, 5–5.5 mm. longis et 0.6–0.7 mm. latis, subobtusis, extus intusque pilis griseis dense hirsutis. Corolla colore ignoto, tubo 3 mm. longo, 0.5 mm. infra orem annulo pilorum instructo, lobis 1.5 mm. longis. Stamina 0.3 mm. supra basin tubi inserta, filamentis 1 mm., antheris 0.9 mm. longis. Discus conicus, 0.8 mm. altus. Stylus 3.0 mm. longus. Capsula 2.5 mm. diam., pilosa.

Hab. Sumatram Occidentalem.

Sumatra. Res. Tapanuli: mountain forest near Lumut, *Junghuhn s.n.* (L, U, typi).

d. Bracteae involucrantes 5.

a. Indumentum luteo-brunneum. Bracteae omnes ovatae; interiores floribus breviores.

6. **Pomazota sylvestris** Ridl. in Trans. Linn. Soc. II. 3: 308, f. 61. 1893, Fl. Mal. Pen. 2: 43. 1923.

Herba suberecta vel e basi breviter repente ascendens, 8–15 cm. alta. Caulis simplex, primum dense, postea sparsius pilis luteo-brunneis hirsutus, 2.5–4 mm. diam. Folia inferiora in petiolum dense hirsutum, usque ad 12 mm. longum contracta; superiora brevius petiolata vel subsessilia; lamina elliptico-lanceolata, 6–11 cm. longa et 2–4.7 cm. lata, apice acuta

vel breviter acuminata, basi acuta vel cuneata, utrimque sed praesertim margine, costa utrimque et nervis subtus pilis luteo-brunneis hirsuta, sicc. supra saturate et subtus dilute olivaceo-brunnea, nervis utroque latere costae 11–13, venulis paucis. Stipulae 12 mm. longae et 10 mm. latae, apice indivisae, extus hirsutae, margine ciliatae. Inflorescentiae pedunculatae; pedunculus hirsutus, ad anthesin circ. 1 cm. longus, deinde usque ad 5.5 cm. accrescens. Bracteae involucrales 5, ovatae, usque ad 15 mm. longae et 11 mm. latae, supra medium contractae, apice obtusae, subcarinatae, extus dense hirsutae, supra contractionem tamen costa margineque exceptis subglabrae; bracteae aliae sensim magnitudine descrescentes, ceterum maxime ut bracteae involucrales; interiores floribus multo breviores. Flores in axillis bractearum involucralium in cymas biparas, in axillis bractearum aliarum in cymas uniparas dispositi. Flores 5-meri, basi bracteae inserti. Ovarium dense pilosum. Calyx extus dense pilosus, tubo 0.3 mm. longo, lobis ovatis, 1 mm. longis et 0.7 mm. latis, margine ciliatis. Corolla alba, tubo 3.5 mm. longo, 0.5 mm. infra orem annulo pilorum munito, lobis 1.2 mm. longis. Stamina 0.8 mm. supra basin tubi inserta, filamentis 1.7 mm., antheris 1.2 mm. longis. Discus cylindricus, 1 mm. altus, farinosus. Stylus 3.5 mm. longus. Capsula pilosa.

Hab. Peninsulam Malayanam et Sumatram Septentrionalem.

MALAY PENINSULA: Pahang: Kota Tongkat, *Evans s.n.* (K, ex Fed. Mal. States Mus.), exemplum typi.

SUMATRA: East Coast Govt: Asahan, between H. Padang and Kopas, *Bartlett 6759* (NY); near Rantau Parapat, Bila, *Rahmat 2582, 2715, 3169* (NY); Tapanuli Res.: Padang si Dempuan, S. Manaun, *Rahmat 4516* (NY); near H. Imbaru, *Rahmat 4685* (NY); Sosopon on Aek si Olip, *Rahmat 5076* (NY).

β. Indumentum rubro-brunneum. Bracteae oblongae vel spathulatae, principales omnes floribus longiores.

7. Pomazota pilosa (Miq.) Brem. n. comb.

Coptophyllum pilosum Miq. in Ann. Mus. Bot. Lugd.-Bat. 4: 230. 1869; Boerl., Handl. Fl. Ned. Ind. 2 (1): 161. 1891; Koorders, Exkursionsfl. Java 3: 253. 1912. *Lasiagathis humilis* Bl. in schedula.

Herba suberecta vel e basi breviter repente ascendens, 7–21 cm. alta. Caulis simplex, raro semel pseudo-dichotome ramificatus, primum dense ferrugineo-pubescens, internodiis bisulcatis, deinde glabrescens et teres, 2–3 mm. diam. Folia in petiolum dense ferrugineo-pubescentem, 1.2–3 cm. longum contracta; lamina lanceolata, 6–14 cm. longa et 1.8–4.5 cm. lata, apice breviter acuminata, basi acuta vel cuneata, supra ferrugineo-hirsuta, costa utrimque et nervis subtus ferrugineo-pubescens, margine ciliata, sicc. supra saturatius, subtus dilute brunnea, interdum supra rubro-brunnea, nervis utroque latere costae circ. 11, venulis paucis. Stipulae 8–10 mm. longae et 4–6 mm. latae, apice indivisae, extus pubescentes, margine ciliatae. Inflorescentiae pedunculatae; pedunculus pubescens, ad anthesin circ. 0.5 cm. longus, postea usque ad 2.5 cm. accrescens. Bracteae involucrales 5, oblongae, 10–15 mm. longae et 6–8 mm. latae, supra medium paulum contractae, apice subacutae, fortiter carinatae, extus sparse pubescentes, intus glabrae, margine praesertim apicem versus ciliatae; bracteae aliae sensim magnitudine decrescentes, internae spathulatae, omnes margine ciliatae, floribus semper longiores, in rosulam densam dispositae. Flores in axillis bractearum involucralium in triades dispositi, in

axillis bractearum aliarum singuli; bracteae florum lateralium triadis parvae, calyce plerumque breviores. Flores 5-meri, in bracteam paulum egredientes. Ovarium sparse pilosum. Calyx extus sparse pilosus, tubo 0.5 mm. longo, lobis ovatis 0.7 mm. longis et 1 mm. latis, margine ciliatis. Corolla alba, tubo 3.8 mm. longo, 0.5 mm. infra orem annulo pilorum instructo, lobis 1.2 mm. longis. Stamina 1 mm. supra basin tubi inserta, filamentis 1.5 mm., antheris 1 mm. longis. Discus conicus, 0.6 mm. altus. Stylus 3.7 mm. longus. Capsula sparse pilosa.

Habitat Javam Occidentalem.

JAVA: Bantam Res.: Tjidjralang, *Kühl & v. Hasselt s.n.* (U) "Lasiagathis humilis" Bl. Buitenzorg Res.: G. Handjawung near Buitenzorg, *Backer 6051* (BZ); G. Butik Buligir near Buitenzorg, *Backer 10757* (BZ); Estate Nanggung near Buitenzorg, *Backer 10580* (BZ); Nirmala near Buitenzorg, *Backer 10757* (BZ); Pasir Kempul near Nirmala, *Backer 11075* (BZ); Java, s.l., *coll. ign. s.n.* (L, U, typi).

SERIES B. Monopodiales

Inflorescentiae ramulos axillares abbreviatos (ex internodio singulo cuius folia stipulis exceptis suppressa sunt constantes) terminantes et inde plerumque oppositae. Pedunculus basi semper squamis stipulaceis munitus. Flores in axillis bractearum semper solitarii. Species 8–10.

a. Bracteae involucrantes 4. Flores pedicellati.

8. **Pomazota rivularis** Hend. in Gard. Bull. Straits Settl. 4: 411, f. 1–3. 1929; Merr. in Papers Mich. Acad. Sci. 23: 193. 1938.
Pomazota involucrata Merr. in Mitt. Inst. Bot. Hamb. 7: 274. 1937.
Coptophyllum bracteatum Khs. in Ned. Kruidk. Arch. 2 (2): 161. 1851; Miq., Fl. Ind. Bat. 2: 175. 1856, absentia typi haud certe sciendum.
?*Coptophyllum capitatum* Miq. apud Ridl., Fl. Mal. Pen. 2: 43. 1923, non Miq., Ind. Bat. 2: 348. 1857.
Coptophyllum capitatum Miq. in errore apud Ridl. in Kew Bull. 1925: 84. 1925.

Herba e basi repente ascendens, 12–20 cm. alta. Caulis simplex, primum sparse hirsutus, internodiis bisulcatis, 2 mm. diam., mox glabrescens et ad 5 mm. diam. accrescens. Folia in petiolum sparse hirsutum, 2–3 cm. longum contracta; lamina oblanceolata, 11–18 cm. longa et 4–6.5 cm. lata, apice acuminata, basi cuneata, sicc. supra olivacea, subtus dilute brunnea, supra sparse hirsuta, costa utrimque, nervis venulisque subtus densius pubescens, margine ciliata, nervis utroque latere costae 14 vel 15, venulis paucis. Stipulae 13 mm. longae et 9 mm. latae, apice indivisae, margine ciliatae, extus nervis hirsutae. Inflorescentiae pedunculatae; pedunculus gracilis, sparse hirtellus, post anthesin usque ad 8 cm. accrescens, basi squamis stipularibus 7 mm. longis instructus; capitulum 3 cm. diam. Bracteae involucrales 4 ovato-oblongae, 9–15 mm. longae et 5–12 mm. latae, subobtusae, margine et costa ciliatae; bracteae aliae praesertim centrum versus multo angustiores, spathulatae; internae 8 mm. longae et 1.6 mm. latae, utrimque longe et densius hirsutae. Flores in axillis bractearum semper solitarii, in bractea 0.5 mm. egredientes, pedicellati, basi pedicelli bracteolis duabus lineari-spathulatis, 3–5 mm. longis et 0.3–0.5 mm. latis, basi conduplicatis, utrimque hirsutis instructi; pedicellus 0.3–1.8 mm. longus. Flores 5-meri, aliqui interdum 4-meri. Ovarium glabrum. Calyx tubo 0.2 mm. longo, lobis oblongis, 2.0 mm. longis et 0.4 mm. latis, ciliatis et utrimque sed praesertim intus sparse hirsutis. Corolla alba vel carneola, tubo 3.4–4.0 mm. longo, 0.6 mm. infra orem annulo pilorum

instructo, lobis 1 mm. longis. Stamina 0.5 mm. supra basin tubi inserta, filamentis 0.5–0.7 mm., antheris 0.7–1.0 mm. longis. Discus 0.5 mm. altus, post anthesin usque ad 1 mm. accrescens. Stylus 3.8 mm. longus. Capsula 2 mm. diam., glabra.

Hab. Peninsulam Malayanam, Sumatram, terrae Borneënsis partem occidentalem.

MALAY PENINSULA: Johore: G. Muntahok, alt. 200 m., *Holttum 19922* (BZ) (ex herb. Sing.); Ulu Kabang, alt. 75 m., *Holttum 10869* (BZ) (ex herb. Sing.), S. Susur Rotan, *Corner s.n.* (BZ) (ex herb. Sing.).

SUMATRA: East Coast Gouvt: Asahan, Aek Munte, alt. 500 m., *Rahmat 9303* (AA); Tomuan Dolok, alt. 1000 m., *Rahmat 9537* (AA); H. Bagasan, *Rahmat 6748, 6800* (AA); West Coast Res.: Padang, S. Bulu, *Beccari 922* (K); Benkulen Res.: s.l. *Brooks s.n.* (K, *C. capitatum* Miq. apud Ridl.). BORNEO: Sarawak: Mt. Matang, *Ridley 11754* (K); Bidi, *Ridley 11752* (K); Western Division: upper S. Serawai, alt. 450 m., *H. Winkler 838* (HBG, TYPE of *P. involucrata* Merr.).

As one of the specimens collected in the Malay Peninsula was distributed by the Singapore Herbarium under the name *Coptophyllum capitatum*, it seems probable that the *C. capitatum* of Ridley's "Flora of the Malay Peninsula" represents the species dealt with above.

Henderson, l.c., described the flowers as 4-merous, but the large majority is 5-merous. As Merrill separated his *P. involucrata* from *P. rivularis*, of which he had apparently seen no specimens, mainly on account of the 5-merous flowers, this species can not be kept up.

b. Bracteae involucrantes 5. Flores sessiles.

a. Folia supra glabra. Stipulae apice bipartito. Bracteae interiores spathulatae.

9. **Pomazota scabiosiflora** Brem. n. spec.; TYPUS: *Bünnemeyer 493* (BZ)

Herba e basi breviter repente ascendens, circ. 20 cm. alta. Caulis simplex, primum sparse ferrugineo-pubescens, internodiis bisulcatis, 2.2 mm. diam., deinde glabrescens et teres. Folia in petiolum primum breviter ciliatum, 1–2 cm. longum contracta; lamina oblanceolata vel anguste oblonga, 12–18 cm. longa et 3.5–5.5 cm. lata, apice acuta vel acuminata, basi cuneata, sicc. supra saturate, subtus dilute brunnea, supra glabra, subtus costa nervis venulis pilis ferrugineis primum dense, deinde sparse pubescens, margine primum ciliolata, postea subglabra, nervis utroque latere costae 13 vel 14, venulis paucis. Stipulae 15 mm. longae et 7 mm. latae, apice bipartito, margine primum ciliolatae, deinde glabrescentes. Inflorescentiae pedunculatae; pedunculus glaber, ante anthesin circ. 1 cm. longus, postea usque ad 6.5 cm. accrescens, basi squamis stipularibus 6.8 mm. longis instructus; capitulum usque ad 4 cm. diam. Bracteae involucrales 5, oblongae, 15–20 mm. longae et 5.5–8 mm. latae, subobtusae, basi vix conspicue et apicem versus distincte ciliatae; bracteae aliae spathulatae, magnitudine sensim decrescentes; centrales 6 mm. longae et 2 mm. latae, margine ciliatae, ceterum glabrae. Flores in axillis bractearum semper solitarii, in bracteam circ. 1 mm. egredientes, sessiles, basi bracteolis duabus oblanceolatis, 3 mm. longis et 1 mm. latis, basi conduplicatis, ciliatis instructi. Flores 5-meri. Ovarium glabrum. Calyx tubo 0.3 mm. longo, lobis oblongis, 2.2 mm. longis et 0.4 mm. latis, ciliatis. Corolla luteola, tubo 2.5 mm. longo, 0.2 mm. infra orem annulo pilorum instructo,

lobis 1.5 mm. longis. Stamina 0.5 mm. supra basin tubi inserta, filamentis 1.5 mm., antheris 1 mm. longis, maxima parte exsertis. Discus conicus, 0.6 mm. altus. Stylus 3.3 mm. longus. Capsula 1.7 mm. diam., glabra.

Hab. Sumatram Occidentalem.

SUMATRA: West Coast Res.: N.W. slopes of G. Talamau, alt. 750 m., *Bünnemeyer 493* (BZ, TYPUS).

β. Folia supra sparse hirsuta. Stipulae apice indivisae. Bracteae interiores lineares.

10. **Pomazota batuensis** Brem. n. spec.; TYPUS: *Raap 701* (BZ).

Herba e basi breviter repente ascendens, 8–15 cm. alta. Caulis simplex, primum densius hirsutus, internodiis bisulcatis, deinde sparse hirsutus et subteres. Folia in petiolum densius hirsutum, 8–15 mm. longum contracta; lamina oblanceolata, 4.5–11.5 cm. longa et 2.0–4.5 cm. lata, apice acuminata, basi cuneata, sicc. utrimque dilute brunnea, supra sparse hirsuta, subtus sparse pubescens, costa utrimque nervis venulisque subtus densius pubescens, margine ciliata, nervis utroque latere costae 10–12, venulis paucis. Stipulae 10 mm. longae et 6 mm. latae, apice indivisae, margine ciliatae, ceterum glabrae. Inflorescentiae pedunculatae; pedunculus primum densius, postea sparsius hirtellus, post anthesin usque ad 3 cm. accrescens, basi squamis stipularibus instructus; capitulum usque ad 2.7 cm. diam. Bracteae involucrales 5, oblongae, 12–15 mm. longae et 4–6 mm. latae, subacutae, margine ciliatae, ceterum glabrae; bracteae aliae magnitudine sensim decrescentes; centrales lineares, 5–9 mm. longae et 0.5–0.9 mm. latae. Flores in axillis bractearum semper solitarii, in bracteam circ. 1 mm. egredientes, sessiles, basi bracteolis duabus linearibus, 4.5 mm. longis et 0.4 mm. latis, ciliatis instructi. Flores 5-meri. Ovarium glabrum. Calyx tubo 0.1 mm. longo, lobis oblongis 2–3 mm. longis et 0.3–0.4 mm. latis, ciliatis. Corolla colore ignoto, matura nondum visa. Stamina prope basin tubi inserta. Capsula 1.8 mm. diam., glabra.

Hab. insulas a Sumatra ad occasum, Batu dictas.

BATU ISLANDS: P. Batu, *Raap 701* BZ., typus.

INDEX SPECIERUM

4. *assimilis* Brem. n. spec. — Sumatra et insulis a Sumatra ad occasum.
10. *batuensis* Brem. n. spec. — insulis a Sumatra ad occasum.
bracteata (Khs.) Brem. n. comb. (*Coptophyllum* Khs.), spec. non satis nota — Sumatra.
5. *capitata* (Miq.) Brem. n. comb. (*Coptophyllum* Miq.) — Sumatra.
7. *pilosa* (Miq.) Brem. n. comb. (*Coptophyllum* Miq.) — Java Occidentali.
1. *reptans* Backer ex Brem. n. spec. — Sumatra Australi et Java Occidentali.
8. *rivularis* Hend. — Peninsula Malayana, Sumatra, terra Borneënsi.
9. *scabiosiflora* Brem. n. spec. — Sumatra Occidentali.
3. *simalurensis* Brem. n. spec. — insula a Sumatra ad occasum Simalur dicta.
6. *sylvestris* Ridl. — Peninsula Malayana, Sumatra.
2. *Vanleeuweni* Brem. n. spec. — Sumatra Orientali.

ZEIST,
HOLLAND.

SIDEROBOMBYX BREM. NOV. GEN. RUBIACEARUM HEDYOTIDEARUM

C. E. B. BREMEKAMP

The Bornean plant to be described below as the type of a new genus, resembles in general aspect the species of *Pomazota* Ridl., series *Sympodiales* Brem., but has the silky reddish brown pubescence, the subcapitate didymous stigma and exsuccous dipyrenous drupes of *Xanthophytum* Reinw. ex Bl. It differs from the latter and from the nearly related and perhaps not sufficiently distinct genera *Paedicalyx* Pierre ex Pitard and *Xanthophytopsis* Pitard in the position of the inflorescences, which are not opposite, but at first terminal and afterwards solitary at the nodes, the presence of two large involucral bracts, and also in the floral structure: in the only specimen known so far the style is exserted and the stamens included, whereas in *Xanthophytum* the anthers are apparently always exserted and the style included. From *Pomazota* it differs not only in the nature of the indumentum, in the subcapitate didymous stigma and exsuccous dipyrenous drupes, but also in the nature of the involucre, which consists of two very wide reniform bracts instead of 4, 5 or 8 much narrower ones, and in the inside villous upper half of the corolla-tube.

The resemblance with *Keenania* Hook. f., *Campanocalyx* Val., *Myrioneuron* R.Br., *Polysolenia* Hook. f. and *Leptomischus* Drake is perhaps of greater importance than that with *Pomazota* Ridl. or *Xanthophytum* Reinw. ex Bl. In all these genera the inflorescences are terminal and capituliform, the corolla-tube is villous inside in the upper half, and the flowers are apparently everywhere dimorphic. As the new genus is based on a single specimen, the conclusion that the latter represents the long-styled form of a heterostylous species rests on the resemblance between its flowers and the long-styled ones found in the other genera. At first I was inclined to regard the flowers of the type specimen of my new genus not only as long-styled but also, like those of *Keenania*, as female, because the pollen grains are uncommonly small and thin-walled, but since I have found similar pollen in short-styled flowers of *Myrioneuron* and also in *Xanthophytum*, I have dropped this supposition.

The new genus differs from *Myrioneuron* in the presence of two large involucral bracts and in the nature of the pyrenes, which are apparently indehiscent, from *Keenania* and *Campanocalyx* in the narrowness of the calyx-lobes, from *Polysolenia* in the entire stipules and from *Leptomischus* in the dipyrenous drupes.

Siderobombyx Brem. n. gen.

Rubiacearum Hedyotidearum sensu meo, inflorescentiis primum ter-

minalibus, capituliformibus, corollae tubo intus dimidio superiore villoso, et probabiliter floribus heterostylis ad genera *Keenaniam* Hook. f., *Campanocalycem* Val., *Myrioneurum* R. Br., *Polysoleniam* Hook. f., *Leptomischum* Drake accedens, sed ad eis stigmate subcapitato didymo, insuper a *Keenania* calycis lobis haud imbricatis, a *Campanocalyce* calyce non campanulato, a *Myrioneuro* pyrenis non dehiscentibus et bracteis involucralibus magnis, a *Polysolenia* stipulis indivisis, a *Leptomischo* fructu non opercule dehiscente sed dipyreno distinguendum.

Herba caule sympodiali simplici crassiore. Folia in petiolum satis longum contracta; lamina satis magna, tenuis, subtus primum indumento rubro-brunneo sericeo vestita, penninervia. Stipulae interpetiolares, ovatae acuminatae, indivisae, magnae, persistentes. Inflorescentiae primum terminales; deinde a ramo axillari in positionem lateralem coactae et solitariae ad nodos, pedunculatae, capituliformes, involucratae. Involucrum e bracteis duabus externis magnis, reniformibus et pluribus bracteis internis brevioribus et forma ovatis, oblongis vel oblanceolatis compositum. Flores centro capituli dichasialiter dispositi, bracteis corolla brevioribus suffulti, sessiles, 5-meri, hermaphroditi, probabiliter heterostyli. Ovarium biloculare, placentis peltatis oblongis medio septo stipite brevi affixis, ovulis numerosis. Calyx tubo brevi, lobis lanceolatis acutis, extus dense rubro-brunneo villosis alternantibus cum glandulis baculiformibus. Corolla alba, hypocrateriformis, tubo intus dimidio superiore dense villoso, lobis ovatis acutis, flore aperto patentibus, extus costa sparse pilosis. Stamina in flore longistylo fere ad medium tubum inserta, filamentis glabris brevissimis, antheris subbasifixis, lineari-oblongis, in apiculum longum productis, inclusis. Discus annularis. Stylus glaber in flore longistylo, parte superiore impressionibus antherarum striatus, stigmate capitato didymo. Fructus drupa exsucca dipyrena, calyce persistente coronata, pyrenae ambitu oblongae, osseae, non dehiscentes. Semina rubro-brunnea, angulata, alveolata, alveolis fundo granulatis.

Genus adhuc monotypicum parte septentrionali terrae Borneënsis endemicum.

Species unica: *S. kinabaluensis* Brem. n. spec.

Siderobombyx kinabaluensis Brem. n. spec.; TYPUS: *J. & M. S. Clemens 31540* (BZ).

Herba circ. 45 cm. alta. Caulis primum pilis tenuibus rubro-brunneo-villosus, internodiis bisulcatis, deinde glabrescens et teres, 4 mm. diam. Folia in petiolum primum pilis rubro-brunneis densius villosum, deinde glabrescentem, usque ad 4.5 cm. longum contracta; lamina obovata, 22–27 cm. longa et 8–11 cm. lata, apice acuminata, basi sensim contracta, supra primum sparse pilosa, deinde glabrescens, subtus pilis rubro-brunneis primum dense sericeo-villosus, deinde sparse et vix conspicue pubescens, sicc. supra saturate et subtus dilute brunnea, nervis utroque latere costae 12–13, venulis paucis. Stipulae usque ad 1.8 cm. longae et 1.3 cm. latae, apice indivisae, extus sparse pubescentes, margine densius ciliatae. Inflorescentiae breviter pedunculatae; pedunculus circ. 1.3 cm. longus. Bracteae involucrantes externae 2.5 cm. latae et 1.8 cm. longae, acuminatae; bracteae involucrantes internae satis numerosae, breviores et multo angustiores, ovatae, oblongae et oblanceolatae, ciliatae, omnes steriles. Bracteae fertiles bracteis involucrantibus intimis similiores. Flores later-

ales dichasiorum bracteis lanceolatis quam floribus brevioribus, extus et praesertim margine pilis rubro-brunneis dense villosis suffulti. Ovarium pilis rubro-brunneis dense villosum, 2 mm. longum et 1 mm. diam. Calyx pilis rubro-brunneis extus dense villosus, intus subglaber, tubo 1 mm. alto, lobis lanceolatis 4 mm. longis et 1.3 mm. latis, acutis. Corolla tubo 5 mm. longo, extus pilis rubro-brunneis sparse villoso, intus dimidio superiore dense albo-villoso, lobis 1 mm. longis, costa parce villosis. Stamina in flore longistylo 2 mm. supra basin tubi inserta, filamentis glabris 0.6 mm. longis, antheris longe apiculatis 1.2 mm. longis. Discus 0.3 mm. altus, 1 mm. diam. Stylus in flore longistylo 6 mm. longus. Drupa 3 mm. alta, 2 mm. lata, 1 mm. crassa, didyma, pilis rubro-brunneis sparse villosa.

Hab. terrae Borneënsis partem septentrionalem.

BORNEO. British North Borneo, Mt. Kinabalu, Penibukan, alt. 1200–1500 m., *J. & M. S. Clemens 31540* (BZ).

On one of the two labels attached to the specimen the height is given as 18 feet, but on the other, which is apparently the original one, as 18 inches (18″). As its nearest allies are all comparatively low plants with, as a rule, unbranched stems, I have assumed that the latter is right, and that the preserved shoot represents the whole plant, the roots only excepted.

ZEIST,
HOLLAND.

THE CYPERACEAE COLLECTED IN NEW GUINEA BY L. J. BRASS, II.*

S. T. Blake

With two plates and one text-figure

This paper deals with the genera of the Mapanioideae and most of those of the Scirpoideae. Several collections had previously been examined by Kükenthal, Uittien or Svenson and reference to their determinations is made in the citation of specimens. The treatment of *Cyperus* follows that of Kükenthal in Pflanzenr. 101 (IV. 20) : 1935–6.

Hypolytrum L. C. Richard

Hypolytrum compactum Nees in Linnaea 9: 288. 1835, *nomen*, in Nov. Act. Acad. Caes. Leop. Natur. Cur. 16. suppl. 2: 73. 1843; Kükenth. in Engl. Bot. Jahrb. 59: 53. 1925; 69: 261. 1938; Uitt. in Rec. Trav. Bot. Néerl. 33: 155. 1936, in Meded. Bot. Mus. Herb. Univ. Utrecht 26: 155. 1936; Ohwi in Bot. Mag. Tokyo 56: 209. 1942.

Papua: Western Division: Lake Daviumbu, Middle Fly R., *Brass 7457*, August 1936, plentiful as scattered ground cover in poorer types of soil (det. Uittien).

New for Papua; previously known from Netherlands New Guinea, North-East New Guinea, Aru Islands, Celebes, Borneo, Philippine Islands and Indo-China.

Hypolytrum scabrum Uitt. in Jour. Arnold Arb. 20: 215. 1939.

Papua: Western Division: Oroville Camp, Fly R., *Brass 7398* (type coll.), Aug. 1936, common plant sporadic in tufts on forest floor. Central Division: Mekeo District, *C. T. White 806*, July-August 1918.

White 806 is in rather young flower only; it has a more ample inflorescence than the type-collection, the colour throughout is paler and the mottling on the leaves is very indistinct. A similar indistinct mottling has been noticed on some specimens of *H. latifolium*.

Hypolytrum latifolium L. C. Rich. in Pers. Syn. 1: 70. 1805; F. Muell. Pap. Pl. 2: 34. 1886; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 191. 1900; Valck. Suring. in Nova Guin. Bot. 8: 709. 1912; Kükenth. in Engl. Bot. Jahrb. 59: 53. 1924; 69: 260. 1938.

Netherlands New Guinea: Bernhard Camp, Idenburg R., *Brass 13974*, April 1939, alt. 50 m., common in semi-swampy rain-forest of river plains (clumps ± 1 m. high). Papua: Western Division: Lake Daviumbu, Middle Fly R., *Brass 7553*, August 1936, rain-forest, common undergrowth in damp soil near lake (det. Uittien). Central Division: Kanosia, *Carr 11302*, Feb. 1935, sea-level, marshy forest (ca. 3 ft. tall) (herb. Canberra). Without definite locality, *W. E. Armit, Barton*.

Solomon Islands: Bougainville: Marmaromino, *Kajewski 2188*, Sept. 1930, alt. 50 m., rain-forest, common (a rush growing in swampy places up to 1¾ m. high,

* Botanical Results of the Richard Archbold Expeditions. See Jour. Arnold Arb. 28: 99–116. 1947.

leaves bright green. San Cristobal: Hinuahaoro, *Brass 3044*, Sept. 1932, alt. 900 m., forest floor. Common name: Ti-pi-rekio).

The species ranges from India through Malaysia to Queensland, though the above appears to be the first definite record from Netherlands New Guinea (unless *H. amplectens* Valck. Suring., op. cit., 708, t. 115, be conspecific) and Bougainville.

Kükenthal in 1938, l.c., cites *Carr 12010* as belonging to this species, but I am doubtful of this determination. The specimen seen is very slender with narrow leaves and the lower glumes are longer, narrow, and acute; the spikelets are very young.

Concerning the legitimacy of the name, see S. T. Blake in Proc. Roy. Soc. Queensl. 54: 71. 1943.

Thoracostachyum Kurz

Thoracostachyum bancanum (Miq.) Kurz in Jour. As. Soc. Bengal 38 (2): 76. 1869; Uitt. in Rec. Trav. Bot. Néerl. 33: 136. 1936, in Meded. Bot. Mus. Herb. Univ. Utrecht 26: 136. 1936, with synonymy; Ohwi in Bot. Mag. Tokyo 56: 210. 1942.

Lepironia bancana Miq. Fl. Ind. Bat. Suppl. 1: 604. 1860.

Thoracostachyum subcapitatum Valck. Suring. in Nova Guin. Bot. 8: 710, t. 107. 1912.

PAPUA: Western Division: Palmer R., 2 miles below junction with Black R., *Brass 7096*, June 1936, alt. 100 m., forming open tufted ground cover in special swamp forests on ridges; same place and date, *Brass 7097*, plentiful as ground cover in swamp forests on low plateaus.

Rather widely spread through Malaya, Sumatra and Borneo. In New Guinea it was previously known only from Netherlands New Guinea.

Of the two collections cited above *Brass 7096* is in young flower and his *7097* has mature fruit. Both were determined by Uittien.

Thoracostachyum pandanophyllum (F. Muell.) Domin in Biblioth. Bot. 85: 484 1915; Uitt. in Rec. Trav. Bot. Néerl. 33: 138. 1936, in Meded. Bot. Mus. Herb. Univ. Utrecht 26: 138. 1936, with synonymy.

Hypolytrum pandanophyllum F. Muell. Fragm. Phytogr. Austr. 9: 16. 1875.

Mapania pandanophyllum (F. Muell.) K. Schum. in K. Schum. & Hollr. Fl. Kaiser Wilhelmsl. 25. 1889; in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 189. 1900.

Thoracostachyum hypolytroides (F. Muell.) C. B. Clarke in Hook. f. Fl. Brit. Ind. 6: 681. 1894; Valck. Suring. in Nova Guin. Bot. 8: 710. 1912; Rendle in Gibbs, Fl. Arfak Mts. 250. 1917; Kükenth. in Engl. Bot. Jahrb. 59: 54. 1924.

PAPUA: Western Division: Strickland R., *W. Bauerlen* in 1885; Lake Daviumbu, Middle Fly R., *Brass 7034*, Sept. 1936, one of the principal plants of the floating islands in lake; same locality *Brass 7917*, Sept. 1936, abundant on floating islands of lake and forming characteristic undergrowth of sago and *Melaleuca* swamp forests (leaves erect to 3 m.; inflorescence pale pink, shorter than the leaves); Lower Fly R., east bank opposite Sturt Island, *Brass 8118*, October 1936, forming characteristic undergrowth of *Erythrina* swamp forests (clumps 2.5–3 m. high, leaves erect).

New for Papua; previously known from Malaya, Sumatra, Borneo, Celebes, Palau Islands, Netherlands and North-East New Guinea, and NE. Queensland. All Brass's specimens had been previously determined by Uittien.

Paramapania Uittien

Paramapania simplex (Ridl.) Uitt. in Rec. Trav. Bot. Néerl. 32: 190. 1935, in Meded. Bot. Mus. Herb. Univ. Utrecht 16: 190. 1935.

Thoracostachyum simplex Ridl. in Trans. Linn. Soc. II, Bot. 9: 244. 1916.

Netherlands New Guinea: 4 km. SW. of Bernhard Camp, Idenburg R., *Brass 13481*, March 1939, alt. 850 m., tufted in semishade of flood-swept river banks in rain-forest; 4 km. SW. of Bernhard Camp, Idenburg R., *Brass 13601*, March 1939, alt. 850 m., occasional tufts, slopes of rain-forest ravines. Papua: Western Division: Fly R., 528-mile Camp, *Brass 6647*, May 1936, alt. 80 m., very common little floor plant scattered through the ridge forests (det. Uittien).

New for Papua; previously known only from the type collection from the Snow Range, Netherlands New Guinea. *Brass 6647* is much smaller than the others (the largest leaf seen being only 13 cm. long and 1 cm. wide) with small spikelets about 6 × 4 mm., and somewhat smaller nuts.

Paramapania parvibractea (C. B. Clarke) Uitt. in Rec. Trav. Bot. Néerl. 33: 143. 1936, in Meded. Bot. Mus. Herb. Univ. Utrecht 26: 143. 1936.

Hypolytrum parvibractea C. B. Clarke in Kew Bull. 1899: 114. 1899.

Hypolytrum parvibracteatum C. B. Clarke in Kew Bull. Add. Ser. 8: 51. 1908; Valck. Suring. in Nova Guin. Bot. 8: 709. 1912; Ridl. in Trans. Linn. Soc. II, Bot. 9: 243. 1916.

Hypolytrum parvibracteatum var. *quadriglumatum* Valck. Suring., l.c., and *t. 116.* 1912.

Hypolytrum quadriglumatum Suring., l.c., 709. 1912 (*nomen invalidum*?).

Mapania montana Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 189. 1900.

Thoracostachyum montanum (Lauterb. & K. Schum.) Valck. Suring. in Nova Guin. Bot. 8: 710. 1912; Kükenth. in Engl. Bot. Jahrb. 59: 54. 1924; Ohwi in Bot. Mag. Tokyo 56: 209. 1942.

Thoracostachyum parvibractea (C. B. Clarke) Kükenth. in Engl. Bot. Jahrb. 69: 261. 1938 (*nomen vix validum*).

Paramapania amboinensis Uitt. in Rec. Trav. Bot. Néerl. 32: 191. 1935, in Meded. Bot. Mus. Herb. Univ. Utrecht 16: 191, fig. 4. 1935.

Paramapania montana (Lauterb. & K. Schum.) Uitt. in Rec. Trav. Bot. Néerl. 32: 200. 1935, in Meded. Bot. Mus. Herb. Univ. Utrecht 17: 200. 1935 (*nomen provisorium*).

Netherlands New Guinea: East slopes of Cyclops Mountains, *Brass 8944*, 1938, alt. 575 m., occasional floor plant in tall forest (inflorescence purple); Bernhard Camp, Idenburg R., *Brass 13842*, April 1939, alt. 150 m., frequent tufts in rain-forest of lower mountain slopes. Papua: Central Division: Dieni, Ononge Road, *Brass 3931*, April-May 1933, alt. 500 m., sporadic occurrence on rain forest floor.

Evidently widely spread in New Guinea and has been found in the Moluccas and Celebes (Uittien, ll.cc.).

Some of the names cited in the synonymy have doubtful nomenclatural status. *Hypolytrum quadriglumatum* Valck. Suring. was published as follows:

"**Hypolytrum parvibracteatum** Clarke var. **quadriglumatum**; nov. var., nisi **H. quadriglumatum** species nova."

"Tab. CXVI"

In the explanation of the plate only the ternary combination appears. The binomial *H. quadriglumatum* might be taken as an alternative name,

but because of the use of the word *nisi* (as well as the absence of the binomial from the explanation of the plate) there is at least the possibility that the name should be regarded as a provisional name and therefore invalid.

Paramapania montana (Lauterb. & K. Schum.) Uitt. also seems to be a provisional name ["If it (i.e. ***Thoracostachyum montanum***) turns out to be the same species, the name of the latter (i.e. *Paramapania amboinensis*) should be altered in *P.* ***montana*** Uitt."].

And finally the combination *Thoracostachyum parvibractea* (C. B. Clarke) Kükenth. does not seem to satisfy the requirements of Art. 44. The name was published as follows: "**Th. parvibractea** (C. B. Clarke) Kükenth. comb. nov. — *Th. montanum* Suringar."

There is nothing in the citation to show upon what species of Clarke's Kükenthal based his new combination, though it may be presumed it was *Hypolytrum parvibractea*. The citation of *Th. montanum* Valckenier Suringar and reference to the (much later) work of Uittien leads one to this presumption, but it is no proof.

Paramapania attenuata sp. nov. PLATE I.

Rhizoma lignosum obliquum, circa 5 mm. crassum, fibrillis tectum. Folia equitantia, anguste linearia, basin versus angustata et complicata, in apicem filiformem curvum vel flexuosum longe acutata, 30 usque plus 50 cm. longa, circa 4 mm. lata, coriacea, pallide viridia, plurinervia nervis prominulis mediano subtus distinctissimo, sursum carina marginibusque scabra, apice scaberrima. Scapi 10–20 cm. longi, subtrigono-filiformes, 0.3–0.6 mm. crassi, flaccidi, laeves, glabri, basi vaginis angustis sanguineo-fuscis praediti, prope medium vaginam unicam breviter laminiferam pro more gerentes, 1- vel usque 4-stachyi quo in casu ramuli usque ad 13 mm. longi adsunt. Spiculae brunneae 8–10 mm. longae, sub anthesi 3.5 et sub fructu 5 mm. latae. Glumae 3 mm. longae, suboblongae, apice late rotundatae. Flores 2.5–2.8 mm. longae. Squamulae 5. Stigmata 3. Nux ambitu lanceolata longe acuteque acuminato-rostrata, stipitata, trigona, 6 mm. longa, 1 mm. lata, nitide fusca in rostrum curvum paullo pallidius sensim abeuns; stipes alulatus 1 mm. longus.

NETHERLANDS NEW GUINEA: 6 km. SW. of Bernhard Camp, Idenburg R., *Brass 12930*, (TYPE), Feb. 1939, alt. 1200 m., frequent along crests of ridges in rain-forest.

This new species is most nearly allied to *P. longirostris* (Kükenth.) Uitt. but differs in that the glumes are twice as long, the flowers slightly smaller than the glumes, in the indistinctly 3-angled (not 6-angled) nut passing gradually (not abruptly) into the relatively shorter beak. Of the seven scapes on the type material, 3 have each a single spikelet, 2 have 2 each, and 2 have 4 each.

Mapania Aublet

Subgenus Pandanoscirpus Uittien

Mapania papuana Ridl. in Trans. Linn. Soc. London II, Bot. 9: 246. 1916, Uitt. in Rec. Trav. Bot. Néerl. 33: 151. 1936, in Meded. Bot. Mus. Herb. Univ. Utrecht 26: 151. 1936.

NETHERLANDS NEW GUINEA: 4 km. SW. of Bernhard Camp, Idenburg R., *Brass 13097*, March 1939, alt. 900 m., abundant in mossy-forest undergrowth (stem up to 40 cm. long and plant ± 1.5 m. overall; fruits yellow, fleshy).

As yet known only from Netherlands New Guinea.

Mapania baccifera C. B. Clarke in Kew Bull. Add. Ser. 8: 53. 1908; Uitt. in Rec. Trav. Bot. Néerl. 33: 279. 1936, in Meded. Bot. Mus. Herb. Univ. Utrecht 32: 279. 1936.

SOLOMON ISLANDS: Isabel: Tiratona, *Brass 3219*, Nov. 1932, alt. 600 m., common floor plant in mountain forests (fruit yellow; common name "sesala").

Originally described from an inflorescence and a fragment of a leaf collected by Guppy on Shortland Island (Solomon Islands) and somewhat tentatively assigned to sect. (subg.) *Halostemma*. Uittien ll.cc., records it from Netherlands New Guinea and refers it to subgen. *Pandanoscirpus*. Brass's specimen is an excellent one with two immature inflorescences and four mature infructescences. There is an elongated subhorizontal rhizome about 8 mm. thick with a dense tuft of leaves at the end. The leaves are up to 1 m. long and about 1–1.5 cm. wide, long attenuate to the filiform very scabrous tip, but not much narrowed to the somewhat conduplicate base. The scapes are about 10 cm. long and the inflorescence about 3.5 cm. long and 2–2.5 cm. wide; the nut is 7–9 mm. long and 3.5–4 mm. wide.

Mapania Archboldii Uitt. in Jour. Arnold Arb. 20: 214. 1939.

PAPUA: Western Division: Palmer R., 2 miles below junction with Black R., *Brass 7164*, July 1936, alt. 100 m., locally abundant in ridge forest undergrowth (achenes black) (type-collection).

Mapania dictyophlebia sp. nov. Subgen. *Pandanoscirpus* Uitt. PLATE II.

Rhizoma lignosum, 8 mm. crassum, fibris tectum. Folia subflaccida usque ad circa 60 cm. longa, 10–20 mm. lata, multinervia reticulata nervis 3 validioribus conspicuis pallidis, basin versus angustata et conduplicata, apice in acumen longum subtriquetrum scaberrimum sensim attenuata, marginibus costaque pro majore parte spinuloso-scabra. Scapi 6–10 cm. longi monostachyi, subtrigoni, striati ceterum laeves, glabri, basi gracillimi circa 0.7 mm. crassi squamis nonnullis pallidis laxis breviter obtecti, sursum admodum incrassati circa 1 mm. crassi. Spicula pallide brunnea, 13–15 mm. longa, sub anthesi fere oblonga circa 5 mm. lata, sub fructu tandem subglobosa usque ad 14 mm. lata. Glumae ovato-oblongae, obtusae, 8 mm. longae, multinerves, marginibus hyalinae sursum minute ciliolatae. Flores oblique lineares, 9 mm. longae. Nux obovato-pyriformis, apiculata, breviter stipitata, haud angulata, indistincte crebreque rugulosa, 4.2 mm. longa (stipite 0.8 mm. longo incluso), 2.4 mm. lata; exocarpium spongiosum; endocarpium durum, nigrum.

NETHERLANDS NEW GUINEA: 4 km. SW. of Bernhard Camp, Idenburg R., *Brass 13428* (TYPE), March 1939, alt. 850 m., rain-forest, one clump on the bank of a small stream.

Allied to *M. Archboldii* Uitt., differing in the broader, less rigid, conspicuously tessellated leaves, smooth scapes, smaller spikelets and flowers and smaller nut less acuminate at each end.

Mapania cuspidata (Miq.) Uitt. in Jour. Arnold Arb. 20: 213. 1939.

Lepironia cuspidata Miq. Fl. Ind. Bat. Suppl. 1: 603. 1860.

Mapania petiolata C. B. Clarke var. *cuspidata* (Miq.) Uitt. in Rec. Trav. Bot.

Néerl. 33: 282. 1936, in Meded. Bot. Mus. Herb. Univ. Utrecht 32: 282. 1936; with synonymy.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg R., *Brass 13896*, April 1939, alt. 120 m., frequent in rain-forest of lower mountain slopes.

SOLOMON ISLANDS: San Cristobal: Hinuahaoro, *Brass 3046*, Sept. 1932, alt. 900 m., forest floor, common (flower yellow).

The typical form of the species has been recorded from Malaya, Sumatra, Java and Borneo. Uittien, ll.cc., distinguishes three varieties, closely connected with one another and the typical form by intermediates; he refers (1939, l.c.) *Brass 7382* from the Palmer River, Papua (which I have not seen) to var. *petiolata* (C. B. Clarke) Uitt. l.c., which appears to be pan-Malaysian. *Carr 12772* from Koitaki, Papua, in herb. Canberra, also appears to belong to this variety; it was referred to *M. petiolata* C. B. Clarke by Kükenthal in Engl. Bot. Jahrb. 69: 261. 1938. *Brass 3046* and *13896* agree with one another as to foliage, which approaches that of var. *augustifolia* (Uitt.) Uitt. rather than var. *petiolata*, but no. *13896* has the short spikelets about 1.5 cm. long of the typical form on short scapes, 4–8 cm. long.

Subgen. **Cephaloscirpus** (Kurz) Bentham & Hooker

Mapania Moseleyi C. B. Clarke in Kew Bull. Add. Ser. 8: 55. 1908.

Mapania Ledermannii Kukenth. in Engl. Bot. Jahrb. 59: 57. 1924; Ohwi in Bot. Mag. Tokyo 56: 212. 1942.

NETHERLANDS NEW GUINEA: 4 km. SW. of Bernhard Camp, Idenburg R., *Brass 13429*, March, 1939, alt. 850 m., rain-forest undergowth, frequent on steep slopes; 6 km. SW. of Bernhard Camp, Idenburg R., *Brass 12804*, Feb. 1939, alt. 1200 m., tufted terrestrial, occasional in rain-forest.

Uittien in Jour. Arnold Arb. 20: 213. 1939, cites the type of *Mapania Ledermannii* under *Mapania Moseleyi* Clarke f. *latifolia* forma nov. There appears to be some confusion in the paragraphs concerned and to judge from the description of the leaves of f. *latifolia* and the width of the leaves of other specimens cited, it would appear that Uittien's intention was to regard the type of *M. Ledermannii* Kükenth. (*Ledermann 12990*), *Docters van Leeuwen 10452a* and *Gyellerup 524* as conspecific with *M. Moseleyi*. *Mapania Moseleyi* f. *latifolia* is then to be regarded as based entirely on *Brass 7384* (which I have not seen) which differs from the type in having no stem-leaves besides the characters given in the Latin diagnosis. *Brass 12804* and *13429* have each two stem-leaves; the leaves on *12804* are 8–10 mm. wide, in *13429* they are 5–7 mm. wide.

Mapania macrocephala (Gaud.) K. Schum. in Warb. in Engl. Bot. Jahrb. 13: 265. 1891; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 189. 1900; Valck. Suring. in Nova Guin. Bot. 8: 711. 1912; Ridl. in Trans. Linn. Soc. II, Bot. 9: 245. 1916; Kükenth. in Engl. Bot. Jahrb. 59: 56. 1924; Rehd. in Jour. Arnold Arb. 14: 65. 1933; Ohwi in Bot. Mag. Tokyo 56: 211. 1942.

Hypolytrum macrocephalum Gaud. in Freycin. Voy. 414. 1826.

Cephaloscarpus macrocephalus (Gaud.) Kurz in Jour. As. Soc. Bengal 38 (2): 83. 1869.

Lepironia macrocephala (Gaud.) Miq. Ill. Fl. l'Arch. Ind. 64, *t. 27*. 1871.

PAPUA: Western Division: Palmer R., 2 miles below junction with Black R., *Brass 7241*, July 1936, alt. 100 m., in large clumps in swamps and on banks of streams cutting flood plains (leaves ± 4.5 m. long, 6 cm. broad; infructescence ± 8 cm. long, 9 cm. diam.) (det. Uittien). Central Division: Upoia, Vailala R., *Brass 1158*, March 1926, in large clumps in swampy soil resembling in appearance a young *Pandanus* (leaves 6–7 ft. long, recurved, margins serrate; peduncle erect 18–12 in. high, 3-angled with one or two long leaf-like bracts with sheathing leaves on lower portion).

SOLOMON ISLANDS: Bougainville: Kugumaru, Buin, *Kajewski 1987*, July 1930, alt. 150 m., in swamps, common (a rush up to 2 m. high, leaves slightly serrated, buds covered with short fine silky hair).

Previously known from the Moluccas, Admiralty Islands, New Ireland, Netherlands New Guinea and the Central Division of Papua (*Brass 1158*, cf. Rehder, l.c.). It also occurs in north-east Queensland (S. T. Blake in Proc. Roy. Soc. Queensl. 58: ined.).

Lepironia L. C. Richard

Lepironia articulata (Retz.) Domin in Biblioth. Bot. 85: 486. 1915.

Restio articulatus Retz. Observ. 4: 14. 1786.

Lepironia mucronata L. C. Rich. in Pers. Syn. 1: 70. 1805; Kükenth. in Engl. Bot. Jahrb. 59: 58. 1924.

PAPUA: Western Division: Lake Daviumbu, Middle Fly R., *Brass 7605*, August 1936, erect in bluish stands, over 2 m. high, forming small islets in the swamps; Gaima, Lower Fly R. (east bank), *Brass 8355*, Nov. 1936, associated with *Scleria chinensis* and *Restio* sp. in extensive open marshes in savannah forest.

New for Papua. The species is known from Malaysia, Caroline Islands, N. and E. Australia, Fiji, Madagascar, and is cultivated in China. In New Guinea it was previously known only from a single collection from North-East New Guinea. The nomenclature has been discussed by me in Proc. Roy. Soc. Queensl. 54: 71, 72. 1943.

Cyperus Linnaeus

Subgen. Eucyperus (Griseb.) C. B. Clarke

Cyperus stoloniferus Retz., Observ. 4: 10. 1786; Valck. Suring. in Nova Guin. Bot. 8: 698. 1912.

Cyperus Carrii Kükenth. in Engl. Bot. Jahrb. 69: 256. 1938.

PAPUA: Central Division: Hisiu, *Carr 11415*, Feb. 1935, sandy beaches, sea-level (herb. Canberra).

It was on this collection that Kükenthal founded his *C. Carrii* which he placed in subgenus *Mariscus* sect. *Thunbergiani*. The specimen in herb. Canberra has well-developed tubers, is certainly *Eucyperus*, and, although somewhat immature as to the nuts, is evidently the wide-spread chiefly coastal *C. stoloniferus* Retz. The specimen seen by Kükenthal apparently bore no tubers; otherwise his description accords with the specimen seen by me. *Cyperus stoloniferus* ranges from Madagascar and India to Queensland, but has not previously been recorded for Papua.

Cyperus digitatus Roxb. Hort. Beng. 81. 1814, *nomen*, Fl. Ind. 1: 205. 1820; F. Muell. in Proc. Linn. Soc. N.S. Wales II, 2: 422. 1887, and Pap. Pl. 2: 69. 1890; Valck. Suring. in Nova Guin. Bot. 8: 699. 1912; Kükenth. in Engl. Bot. Jahrb. 59: 45. 1924, in Pflanzenr. 101 (IV. 20): 55. 1935.

Cyperus auricomus Sieb. sensu K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 191. 1900, not *C. auricomus* Sieb.

Cyperus racemosus Retz. sensu K. Schum. & Lauterb., l.c., 192, not *C. racemosus* Retz.

Cyperus auricomus var. *microstachyus* Boeck. in K. Schum. & Hollr. Fl. Kaiser Wilhelmsl. 23. 1889.

PAPUA: Western Division: Penzara, between Morehead and Wassi Kussa Rivers, *Brass 8446A*, Dec. 1936, in marshy shallows of waterhole (det. Kükenthal). Central Division: Haga, Loloki River, *Brass 892*, Jan. 1926, growing on swamp borders, 2 ft. high.

Kükenthal, in Engl. Bot. Jahrb. 69: 255. 1938, refers *Carr 15532* to this species, but the specimen under this number in herb. Canberra belongs to *C. distans* L.f.

Cyperus malaccensis Lam. Illustr. 1: 146. 1791; Kükenth. in Pflanzenr. 101 (IV. 20): 86. 1935, and in Engl. Bot. Jahrb. 69: 255. 1938.

PAPUA: Western Division: Lower Fly R. east bank opposite Sturt Island, *Brass 8083*, October 1936, on river mud flats; Gaima, Lower Fly R. (east bank), *Brass 8312*, Nov. 1936, codominant with no. *8311* (= *Scirpus grossus* L.f.) in a dense sedge community, 1–1.2 m. high, on open sandy foreshores covered by spring tides. Gulf Division: Vailala Estuary, *Brass 1185*, March 1926, on tidal mudbanks (3–4 ft. high). Central Division: Arda R., *Carr 11427*, Feb. 1935, sea-level, marshes along river bank, growing in brackish water (ca. 2 ft. tall — native name "Geida," used for making sleeping mats, etc.). Eastern Division: Domara R., *Brass 1582*, May 1926, on muddy river bank (stems used by natives for mat-making).

Widely spread in the Eastern Hemisphere, from Mesopotamia to Polynesia and Northern Australia. Kükenthal has seen all Brass's collections and nos. *1185, 1582* are cited in his monograph.

Cyperus Zollingeri Steud. in Zollinger, Verz. Ind. Archip. 2: 62. 1854, *nomen*, Synops. Cyp. 17. 1855; Kükenth. in Engl. Bot. Jahrb. 59: 44. 1924; 69: 255. 1938, in Pflanzenr. 101 (IV. 20): 133. 1935; Ohwi in Bot. Mag. Tokyo 56: 200. 1942.

NETHERLANDS NEW GUINEA: Balim R., *Brass 11730*, Dec. 1938, alt. 1600 m., deforested slopes, abundant on sandy soil. PAPUA: Western Division: Gaima, Lower Fly R. (east bank), *Brass 8249*, Nov. 1936, open savannah forest, yellowish sedge common on hard soils (det. Kükenthal). Central Division: Mafulu, *Brass 5407*, Sept.-Nov. 1933, alt. 1250 m., rare on rubbly soil ridge-crest in *Castanopsis* forest.

The species is widely spread in the Old World tropics.

Cyperus distans L.f. Suppl. 103. 1781; F. Muell. Pap. Pl. 1: 73. 1876; Becc. in D'Albertis New Guinea 2: 399. 1880; Valck. Suring. Nova Guin. Bot. 8: 699. 1912; Kükenth. in Engl. Bot. Jahrb. 59: 44. 1924, in Pflanzenr. 101 (IV. 20): 137. 1935; Ohwi in Bot. Mag. Tokyo 56: 199. 1942.

PAPUA: Central Division: Laloki R., *C. T. White 172*, July-August 1918, Mafulu, *Brass 5533*, Sept.-Nov. 1933, 1250 m., wet ground on roadside in forest; Isuarava, *Carr 15532*, Feb. 1936, alt. ca. 4500 ft., damp places (herb. Canberra); Bella Vista, *C. T. White 418*, July-August 1918, alt. ca. 5000 ft.

Cosmotropical; Carr's collection was referred to *C. digitatus* Roxb. by Kükenthal in Engl. Bot. Jahrb. 69: 255. 1938.

Cyperus Iria L. Sp. Pl. 1: 45. 1753; K. Schum. in Notizbl. Bot. Gart. Mus. Berlin 2: 95. 1898; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 192. 1900; Valck. Suring. in Nova Guin. Bot. 8: 698. 1912; Kukenth. in Engl. Bot. Jahrb. 59: 44. 1924, in Pflanzenr. 101 (IV. 20): 150. 1935.

PAPUA: Western Division: Daru Island, *Brass 6055*, March 1934, road ditches, not common; Daru Island, *Brass 6298*, March 1936, wet ground in open situations, not common (det. Kükenthal).

New for Papua. The species is widely spread in the tropical and some subtropical parts in Asia and Australia, and occurs, apparently as an introduction, in parts of the United States and the West Indies.

Cyperus platystylis R. Br. Prodr. 214. 1810.

PAPUA: Western Division: Lake Daviumbu, Middle Fly R., *Brass 7631*, August 1936, common on swamp margins and floating islands of lake (det. Kükenthal).

New for New Guinea. The species has been recorded from south-east Asia (India to Malaya), Java, Borneo, Queensland and New South Wales.

Cyperus diffusus Vahl, Enum. 2: 321. 1806; F. Muell. Pap. Pl. 1: 31. 1876; K. Schum. & Hollr. Fl. Kaiser Wilhelmsl. 24. 1889; Warb. in Engl. Bot. Jahrb. 13: 264. 1891; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 192. 1900; Palla in Rechinger, Denkschr. Math.-Naturw. Kais. Akad. Wiss. Wien 89: 498. 1913; Ridl. in Trans. Linn. Soc. II, Bot. 9: 241. 1916; Ohwi in Bot. Mag. Tokyo 56: 199. 1942.

Cyperus pubisquama Steud. in Zoll. Verz. Ind. Arch. 2: 62. 1854; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 192. 1900.

Cyperus diffusus var. *macrostachyus* Boeck. in Linnaea 35: 534. 1868; Kükenth. in Pflanzenr. **101 (IV. 20)**: 209. 1936.

Cyperus diffusus var. *pubisquama* (Steud.) Hook. f. in Trimen, Handb. Fl. Ceylon 5: 28. 1900; Kükenth. in Engl. Bot. Jahrb. 59: 43. 1924.

Cyperus diffusus var. *celebicus* (Miq.) Kükenth. in Pflanzenr. 101 (IV. 20): 208. 1936.

Cyperus diffusus f. *macrostachyus* (Boeck.) Valck. Suring. in Nova Guin. Bot. 8: 697. 1912.

Cyperus diffusus f. *microstachya* Valck. Suring. l.c.

Cyperus diffusus f. *princeps* Valck. Suring. l.c.

Cyperus diffusus f. *celebicus* (Miq.) Kükenth. in Engl. Bot. Jahrb. 59: 43. 1924.

PAPUA: Without definite locality, *Mrs. H. P. Schlenker*, Sept. 1909. Western Division: Lake Daviumbu, Middle Fly R., *Brass 7690*, Sept. 1936, in semi-shade in swamp-margins; Lower Fly R., east bank opposite Sturt Island, *Brass 8141*, October 1936, plentiful as scattered ground cover in open parts of *Erythrina* swamp forests; Penzara, between Morehead and Wassi Kussa Rivers, *Brass 8445*, Dec. 1936, semi-shade, in creek at margin of rain-forest. Central Division: Mekeo District, *C. T. White 810*, July-Aug. 1918.

SOLOMON ISLANDS: San Cristobal: Balego-nagonago, *Brass 2705*, August 1932, alt. 1500 ft., pathways and clearings in the rain-forests.

Brass 2705, *8141*, *White 810*, and *Schlenker's* specimen correspond more or less to *C. diffusus* var. *macrostachyus* Boeck. and *Brass 8141* was so determined by Kükenthal. But Kükenthal has also determined *Brass 7690* as belonging to this variety, though to me the specimen appears to be at least as close to the typical form as is *Brass 8445*, determined by Kükenthal simply as *C. diffusus*. The species is somewhat variable and two entities may indeed be involved but to judge from the series of specimens seen by me from Malaya, Philippine Islands and Queensland and those cited above, var. *macrostachyus* is too closely connected with the typical form by intermediates to warrant nomenclatural recognition. The degree of spreading of the glumes, which has been stressed as a distinguish-

ing character, seems to depend to some extent on variations in conditions during the drying of the specimen and to some extent also on the physiological state of the plant at the time of gathering. The length and the direction of the mucro on the glumes are certainly inconstant.

Cyperus pubisquama Steud. and *C. diffusus* var. *macrostachyus* Boeck. appear to have been founded on the same type, or at least on the same collection. The latter ternary combination has priority over *C. diffusus* var. *pubisquama* (Steud.) Hook. f. (1900), a combination made independently at a later date by Kükenthal (1924, l.c.). *Cyperus diffusus* f. *princeps* Valck. Suring. appears to be what Suringar takes as the typical form.

This wide-spread tropical species seems not to have been recorded previously from the Solomon Islands.

Cyperus cinereobrunneus Kükenth. sp. nov. in scheda. (Sect. *Incurvi* Kükenth.). FIG. 1, A.

Rhizoma breve? Culmus (unicus visus) 43 cm. altus, apice 2 mm. crassus, acute triqueter et leviter compressus, angulis sursum minute scaberulus, basi solum foliatus. Folia plura culmo multo usque duplo longiora, linearia, longe acuteque attenuata, 3.5–5 mm. lata, carina et marginibus plerumque recurvis vel revolutis tenuiter scabra, nervis 3 quam ceteris plus conspicuis; vaginae brunneae. Bracteae 4 foliiformes, inflorescentiam superantes, ima culmo longior. Anthela semicomposita; radii 5 fere filiformes, subtrigoni, angulis sursum scaberuli, imus 4 cm. longus; prophylla pallida brunneotincta, ore obliquissima; bracteolae fere squamiformes; radioli brevissimi. Spiculae 3–5-nim digitatae vel solitariae, cinereo-brunneae, lineares, acutae, compressae, 8–10 mm. longae, ca. 2 mm. latae, 12–16-florae. Rhachilla recta, vix alata. Glumae subcoriaceae, 2.3–2.7 mm. longae, (explanatae) oblongo-ovatae, obtusae, mucronatae, crebre circa 15–17-nerves in parte superiore sola distincte carinatae, incurvae, basi articulatae, marginibus subhyalinae et sursum admodum involutae, 3–4 imae vacuae gradatim breviores. Stamina 3; antherae 0.7 mm. longae, apice haud setosae; filamenta linearia ferruginea. Stylus 0.7–0.9 mm. longus, ima basi excepta pilosulus; stigmata 3 pilosula, 0.5–0.6 mm. longa. Nux ellipsoidea, acuta, triquetra, lateribus concava, circa $\frac{1}{2}$ glumam adaequans, 1.4–1.5 mm. longa, 0.7 0.8 mm. lata.

PAPUA: Western Division: Oroville Camp, Fly R., *Brass 7418* (TYPE), August 1936, in tufts on forest-floor.

The specimen seen consists of a single culm with a very short piece of rhizome attached. The label bears the determination "Cyperus cinereobrunneus Kükenth. sp. nov." There is no evidence that a description has been published or even drawn up.

The species appears to be most closely allied to *C. subpapuanus* Kükenth. but has narrow leaves, the glumes incurved to the tip with smooth not scabrous keel and with more numerous nerves, acute nuts and a longer style. The narrow leaves, incurved tips of the glumes and acute nut recall *C. meistostylus* S. T. Blake, but the leaves are more numerous, the spikelets are more distinctly digitate, the nut is relatively shorter and the style is longer. It somewhat resembles the Australian *C. semifertilis* S. T.

Blake in appearance and in that the lowermost glumes are smaller and empty, but it differs in that all the flowers (except perhaps the one uppermost in the spikelet) are bisexual, in the longer glumes, and in that the nut is much smaller than the glume and has concave sides.

Cyperus meistostylus sp. nov. (Sect. *Incurvi* Kükenth.). FIG. 1, B.

Herba graminea perennis, rhizomate brevissimo. Culmi caespitosi, erecti, acute triquetri, laeves, 26–33 cm. alti, apice usque 2 mm. crassi. Folia pauca prope basin culmi stipata quorum superiora culmo breviora vel inflorescentiam valde superantia, linearia, sursum longe attenuata, basin versus haud vel minime angustata, 5–7 mm. lata, tenuiter nervosa nervis 3

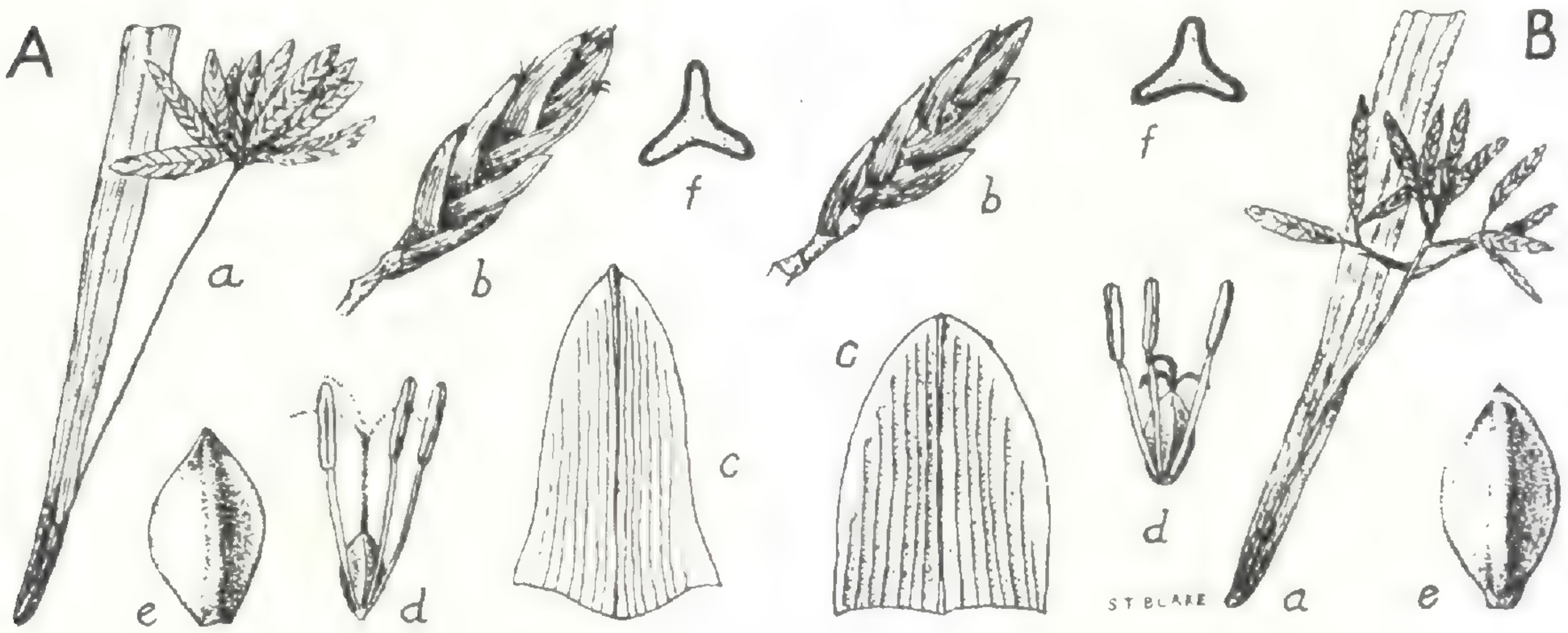


FIG. 1. A. *Cyperus cinereobrunneus* Kükenth.; B. *Cyperus meistostylus* S. T. Blake: *a*. one of the longer rays of the inflorescence with the lower part of its bract, × 1; *b*. upper part of spikelet with the lower glumes removed to show rhachilla, × 4; *c*. glume, flattened out, × 10; *d*. flower, × 10; *e*. nut, × 10; *f*. transverse section of nut, × 10. Figures from type-specimens.

plus prominulis, carina marginibusque sursum minute scabra; vaginae purpurascentes. Bracteae foliiformes valde inaequales, 3 inflorescentia longiores et ima usque ad 30 cm. longa. Anthela semicomposita, contracta, 3.5–4.5 cm. diam.; radii 4 usque ad 3 cm. longi, rigidi, compressi uno latere concavi; radioli, si adsunt, breves; prophylla purpureo-striata, ore obliquissima. Spiculae 3–5-nim approximatae, haud digitatae, lineares, acutae, compressae, 5–12 (plerumque 7–8) mm. longae, 1.5 mm. latae, 8–16-florae. Rhachilla recta vix alata. Glumae laxiusculae tandem subpatulae, fusco-sanguineae, 2–2.4 mm. longae, (explanatae) oblongo-ovatae apice late angusteve rotundatae, muticae, basi articulatae, 13–15-nerves, carina leviter incurvae ejus apice minute setulosae, marginibus glabrae vix hyalinae. Stamina 3, antherae lineares, 0.7 mm. longae apice laeves glabraeque; filamenta linearia ferruginea. Nux elliptica, acuta, triquetra angulis rotundata lateribus concava, brunnea, punctulata, $\frac{2}{3}$–$\frac{3}{4}$ glumae adaequans, circa 1.6 mm. longa et 0.85 mm. lata. Stylus brevissimus minus quam 0.1 mm. longus; stigmata 3, brevia, ca. 0.5 mm. longa, pilosula.

PAPUA: Central Division: Dieni, Ononge Road, *Brass 3933* (TYPE), May 1933, alt. 500 m., scattered through rain-forest and common in regrowth.

The specimen seen consists of a tuft of three culms of which one bears

a young inflorescence, another a mature and the third an over-mature inflorescence. One culm has the uppermost leaf much shorter than the culm; on the others the leaves are very long, up to 42 cm.

The species is allied to *C. tetraphyllus* R.Br., *C. subpapuanus* Kükenth., *C. papuanus* Ridl. and *C. pedunculosus* F. Muell. In appearance it resembles rather closely the Australian *C. tetraphyllus*, but differs in the less digitate spikelets with longer relatively narrower, less broadly rounded, less strongly incurved glumes with more numerous nerves, anthers with non-setulose tips, the nut decidedly shorter than the glumes, rather narrower and more acute with more deeply concave sides, and in the pilosulose stigmas. From the other three species it differs in the narrower leaves; from *C. subpapuanus* it is further distinguished by the non-scabrous keel of the scarcely mucronate glumes which are scarcely excurved at the tip and have more numerous nerves, and by the acute rather than obtuse tip of the nut; from *C. papuanus*, of which the ripe nut is unknown, it is further distinguished by the spikelets not digitate, the broader loosely imbricate glumes and the smooth tips to the anthers; and from *C. pedunculosus* it further differs by its fewer bracts, smaller narrower spikelets less digitately arranged, the rather smaller more obtuse less coriaceous muticous glumes, much shorter style and stigmas, and (relative to the glume) rather larger nut with more deeply concave sides and more acute tip.

Cyperus pedunculosus F. Muell. Fragm. 8: 266. 1874; C. B. Clarke in Kew Bull. 1899: 113. 1899; Valck. Suring. in Nova Guin. Bot. 8: 697. 1912; Kükenth. in Engl. Bot. Jahrb. 59: 43. 1924, in Pflanzenr. **101 (IV. 20)**: 222. 1936.

Cyperus montis-sellae K. Schum. in Warb. in Engl. Bot. Jahrb. **18**: 186. 1894; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 191. 1900; Valck. Suring. l.c. 698.

Cyperus pedunculosus var. *floribundus* Kukenth. in Engl Bot. Jahrb. 59: 44. 1924, in Pflanzenr. **101 (IV. 20)**: 223. 1936.

Cyperus pedunculosus var. *atrocastaneus* Kükenth. in Engl. Bot. Jahrb. 69: 256. 1938.

PAPUA: Central Division: Isuarava, *Carr 15451*, Feb. 1936, alt. ca. 4000 ft., open places (herb. Canberra). Eastern Division: U-uma River, *Brass 1437*, May 1926, on creek-banks (common name "gudua").

In Pflanzenr., Kükenthal (1936) refers *Brass 1437* to var. *floribundus* Kükenth. while *Carr 15451* is a syntype of var. *atrocastaneus* Kükenth. Judged from the material in the Australian herbaria the species varies somewhat in size and degree of division of the inflorescence, colour, size (2.6–3.5 mm. in length), and degree of inrolling of the glumes and in the shape of the nut. The nut varies in outline from obovate to ovate-elliptic with the apex obtuse to more or less acute; in length it is about half as long as the glume. Mueller's type specimens have elongated rays with rather pale coloured glumes; some of the inflorescences are overmature. Other specimens, particularly when immature (as in the case of *Carr 15451*), have intensely coloured glumes, sometimes nearly black. *Cyperus pedunculosus* var. *floribundus* appears to comprise the larger plants with

very mature spikelets which keep on lengthening after the lower glumes have fallen away; var. *longibracteatus* Domin in Biblioth. Bot. 85: 425, fig. 98. 1915* and var. *atrocastaneus* are young or youngish plants with short rays.

Outside New Guinea the species occurs in rain-forests in Eastern Queensland.

Cyperus Haspan L. Sp. Pl. 1: 45. 1753 (excl. Herb. Linn.); Valck. Suring. in Nova Guin. Bot. 8: 697. 1912; Ridl. in Trans. Linn. Soc. II, Bot. 9: 241. 1916; Kükenth. in Pflanzenr. 101 (IV. 20): 247. 1936, in Engl. Bot. Jahrb. 69: 256. 1938; Ohwi in Bot. Mag. Tokyo 56: 200. 1942.

PAPUA: Western Division: Lake Daviumbu, Middle Fly R., *Brass 7530*, August 1936, savannahs, occasional on margins of swamps (det. Kükenthal); Daru Island, *Brass 6053*, March 1934, common in road ditches, stems 3-angled. Central Division: Koitaki, *Carr 12276*, May 1935, swamps in open savannah land, ca. 1500 ft. (ca. 2 ft. tall).

Carr's specimens represent the form with creeping rhizomes; the collection was cited by Kükenthal, 1938. *Brass 6053* appears also to represent this form, while the tufted form is represented by the other collection. These collections are the only ones known from Papua of this widely spread species. It has not been reported from North-East New Guinea.

Cyperus aquatilis R. Br. Prodr. 213. 1810.

PAPUA: Western Division: Daru Island, *Brass 6056*, March 1934, common in road ditches, stem 3-angled.

Previously known only from N. and NE. Australia. The taxonomy has been discussed elsewhere in Proc. Roy. Soc. Queensl. 51: 36–40. 1940.

•Subgen. **Juncellus** (Griseb.) C. B. Clarke

Cyperus pygmaeus Rottb. Descr. et Icon. 20, t. 14, fig. 4, 5. 1773; Valck. Suring. in Nova Guin. Bot. 8: 697. 1912.

Cyperus Michelianus (L.) Link subsp. *pygmaeus* (Rottb.) Aschers. & Graebn. Synops. II. 2: 273. 1903; Kükenth. in Engl. Bot. Jahrb. 59: 42. 1924, in Pflanzenr. 101 (IV. 20): 312, fig. 35, F-G. 1936.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg R., *Brass 14083*, April 1939, on logs floating in lagoons. PAPUA: Western Division: Penzara, between Morehead and Wassi Kussa Rivers, *Brass 8439*, Dec. 1936, abundant along margins of waterhole.

Previously recorded from North-East New Guinea. The species is widely spread through Africa, S. and E. Asia to Australia.

C. B. Clarke in Jour. Linn. Soc. 21: 29–30. 1884 has set out the evidence for treating *Scirpus Michelianus* L. [*Cyperus Michelianus* (L.) Link] as generically distinct from *Cyperus pygmaeus* and, although the differential characters are not always so obvious as implied by Clarke, I believe his conclusions to be correct. Kükenthal in Pflanzenr. 101 (IV. 20): 14 and 311 regards *S. Michelianus* as a somewhat anomalous species of *Cyperus* differing only in the spiral, not distichous glumes, and entirely ignores the minute differences in style and nut structure discussed by Clarke. But

* To judge from specimens collected near the type-locality which agree with the description and figure; I have not seen Domin's specimens.

even if the two forms were admitted as congeneric it seems impossible to me to treat *C. pygmaeus* as a subspecies of *C. Michelianus* as has been done by Kükenthal, l.c., 312, following Ascherson & Graebner.

The two collections cited above consist of greatly elongated plants answering more or less to Kükenthal's *C. Michelianus* subsp. *pygmaeus* f. *filifolius* (Franch. & Sav.) Kükenth., l.c., 314, and *Brass 8439* was received labelled as such. But similarly elongated individuals are quite common in numerous annual Cyperaceae and at least in most cases are due to local environmental conditions, and it seems quite unnecessary to distinguish them taxonomically.

Subgen. Pycreus (Beauv.) C. B. Clarke

Cyperus globosus All. Fl. Pedem. 49. 1789; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 191. 1900; Kükenth. in Engl. Bot. Jahrb. **59**: 42. 1924, in Pflanzenr. **101 (IV. 20)**: 352. 1936.

NETHERLANDS NEW GUINEA: Balim R., *Brass 11819*, Dec. 1938, alt. 1600 m., deforested slopes, common on moist sandy soil; 9 km. NE. of Lake Habbema, *Brass 10744*, Oct. 1938, alt. 2800 m., abundant on a native clearing in the forest in large weak clumps; Bele R., 18 km. NE. of Lake Habbema, *Brass 11541*, Nov. 1938, alt. 2200 m., covering a small sandy beach in river. PAPUA: Western Division: Gaima, Lower Fly R. (east bank), *Brass 8309*, Nov. 1936, common on sandy foreshores.

A species widely spread in the Old World, but in New Guinea previously known from North-East New Guinea only. Valckenier Suringar, in Nova Guin. Bot. 8: 697. 1912 cites "**Cyperus globosus** forma **strictus** Cl." from Netherlands New Guinea. Such a combination was not made by Clarke and apparently *C. globosus* var. *strictus* C. B. Clarke was intended. Kükenthal in Pflanzenr. **101 (IV. 20)**: 355. 1936 cites as a synonym of *C. globosus* var. *nilagiricus* (Hochst.) C. B. Clarke "*C. globosus* f. *stricta* Suringar, Het gesl. Cyperus in d. Mal. Arch. (1898) 58, t. II, fig. 12; non C. B. Clarke"; this appears not to refer to New Guinea specimens.

Brass's specimens are much closer to the typical form of the species than to any of the described varieties. His *8309* has the nut broadest at the middle and Kükenthal has in MS. suggested distinguishing it as a variety. But from the material of the species in the Queensland Herbarium there seems a perfect intergrading series from such oblong-elliptic nuts to the much more usual obovate nuts; in other words the widest part of the nut is at or a little above the middle, and in the latter case the nut is sometimes narrowed to a greater degree towards the base than towards the apex.

Cyperus suleinux C. B. Clarke in Jour. Linn. Soc. **21**: 56. 1884; Kükenth. in Engl. Bot. Jahrb. **59**: 42. 1924, in Pflanzenr. **101 (IV. 20)**: 364, *fig. 43*. 1936.

PAPUA: Central Division: Sogere, *L. S. Smith N. G. 51*, May, 1944, alt. ca. 450 m., slender sedge 6 in. high growing along track through dry low-lying area.

Previously recorded from North-East New Guinea. Elsewhere known from India to Tonkin and the Moluccas.

Cyperus polystachyos Rottb. Descr. et Icon. 39, t. 11, fig. 1. 1773; K. Schum. in Engl. Bot. Jahrb. 9: 195. 1888; Boeck. in Engl. Bot. S.M.S. Gazelle 4 (1): 14. 1889; Valck. Suring. in Nova Guin. Bot. 8: 696. 1912; Kükenth. in Engl. Bot. Jahrb. 59: 42. 1924, in Pflanzenr. **101 (IV. 20)**: 367. 1936.

PAPUA: Western Division: Daru Island, *Brass 6284*, March 1936, mixed with other sedges or in small pure stands in swamp-margins (det. Kükenthal).

Widely spread throughout the warmer parts of the world, but not yet found on the main island of New Guinea.

Cyperus nervulosus (Kükenth.) S. T. Blake in Proc. Roy. Soc. Queensl. **51**: 41. 1940.
Cyperus pumilus var. *nervulosus* Kükenth. in Pflanzenr. **101 (IV. 20)**: 378. 1936.

PAPUA: Central Division: Baroka, Mekeo District, *Brass 3731*, April 1933, alt. 30 m., damp savannah flat, plentiful.

Previously known only from N. and NE. Australia.

Subgen. **Mariscus** (Gaertn.) C. B. Clarke

Cyperus stenophyllus Valck. Suring. in Nova Guin. Bot. 8: 701, t. 114. 1912; Kükenth. in Engl. Bot. Jahrb. **59**: 47. 1924.
Cyperus ornans Valck. Suring., l.c., 700, t. 113. 1912; Kükenth. in Pflanzenr. **101 (IV. 20)**: 418. 1936, in Engl. Bot. Jahrb. **69**: 256. 1938.
Cyperus stenophyllus Valck. Suring. var. *ornans* (Valck. Suring.) Kükenth. in Engl. Bot. Jahrb. **59**: 47. 1924.
Cyperus ornans Valck. Suring. var. *stenophyllus* (Valck. Suring.) Kükenth. in Pflanzenr. **101 (IV. 20)**: 419. 1936.

PAPUA: Central Division: Kanosia, *Carr 11107*, Feb. 1935, alt. ca. 100 ft., damp places under light shade (herb. ca. 2 ft. tall) and *Carr 11346*, Feb. 1935, alt. ca. 50 ft., river banks in forest (herb. ca. 15 in. tall) (both in herb. Canberra).

These specimens were cited by Kükenthal in 1938, l.c., as *C. ornans*. The names *Cyperus ornans* and *Cyperus stenophyllus* were published simultaneously. Under these circumstances, according to Art. 56 of the International Rules of Nomenclature, "the author who first adopts one of them, definitely treating another as a synonym or referring it to a subordinate group must be followed." Accordingly, *C. stenophyllus* must be used for the species in its extended sense and Kükenthal erred in changing his earlier treatment in 1936.

I do not think that the two species described by Valckenier Suringar can be distinguished from one another. As here understood *C. stenophyllus* is very close to the Australian *C. Bowmanii* F. Muell. ex Benth. from which it differs in that the spikelets are slightly thicker, more numerous and rather more loosely arranged on the rays, and the base of the plant is harder and moderately swollen, with dark-coloured sheaths. It appears to be restricted to the islands north of Australia from Java and the Philippines to the Solomon Islands and Tonga.

Cyperus compactus Retz. Observ. 5: 10. 1789; Kükenth. in Pflanzenr. **101 (IV. 20)**: 423. 1936, in Engl. Bot. Jahrb. **69**: 256. 1938; Ohwi in Bot. Mag. Tokyo **56**: 200. 1942; non Lam. (1791 or later).
Cyperus compactus f. *decolorans* (Kükenth.) Kükenth. in Pflanzenr., l.c., 424.
Cyperus dilutus Vahl, Enum. Pl. 2: 357. 1806; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 193. 1900; Valck. Suring. in Nova Guin. Bot. 8: 700. 1912; Kükenth. in Engl. Bot. Jahrb. **59**: 45. 1924.
Cyperus dilutus f. *decolorans* Kükenth. in Engl. Bot. Jahrb. 59: 45. 1924.

PAPUA: Western Division: Lake Daviumbu, Middle Fly R., *Brass 7671*, Sept. 1936, conspicuous glaucous species sporadic on swamp-margins and on floating islands in the lake (det. Kükenthal); Dagwa, Oriomo R., *Brass 5921*, Feb.-March 1934, alt.

40 m. shallows of a lagoon on savannah, (tall grey sedge with striate leaves). Central Division: Kanosia, *Carr 11764*, April 1935, sea-level (herb. Canberra).

Carr's collection was cited by Kükenthal (1938, l.c.). Brass's specimens appear to be the only other specimens of this species known from Papua. The species has been reported from North-East and Netherlands New Guinea and extends northwards and westwards to South China and India and has been introduced into Reunion and Mauritius. The f. *decolorans* covers those (herbarium) specimens with paler coloured or faded spikelets and appears to have no real taxonomic significance; see below under *C. Holoschoenus*.

Cyperus javanicus Houtt. Nat. H. Hist. 13: Aanwyz. Plaat. (1). t. 88, f. 1. 1782; Merr. in Jour. Arnold Arb. 19: 321. 1938; non. Kükenth.

Cyperus pennatus Lam. Illustr. 1: 144. 1791; F. Muell. Pap. Pl. 2: 34. 1886; K. Schum. in Warb. in Engl. Bot. Jahrb. 13: 264. 1891; K. Schum. in Notizbl. Bot. Gart. Mus. Berlin 2: 96. 1898; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 193. 1900; Valck. Suring. in Nova Guin. Bot. 8: 700. 1912; Kükenth. in Pflanzenr. 101 (IV. 20): 476, fig. 53, A-G. 1936.

Cyperus stuppeus Forst. f. Prodr. 89. 1786 (*nomen nudum*); Kükenth. in Engl. Bot. Jahrb. 59: 45. 1924.

Cyperus canescens Vahl, Enum. Pl. 2: 355. 1806, Guppy in Solomon Islands and Natives 304. 1887.

PAPUA: Western Division: Penzara, between Morehead and Wassi Kussa Rivers, *Brass 8444*, Dec. 1936, savanna forests, on flats of creek; Daru Island, *Brass 6271*, March 1936, frequent on damp soil in garden fallow growths (erect to 70-80 cm.); Daru Island, *Brass 6334*, March 1936, of occasional occurrence on littoral sand ridges. Gulf Division: Maclatchie Point, *Brass 1184*, March 1926, a coast plant. Central Division: Hula, *Brass 379*, October 1925, just above tide mark on sandy foreshores (4 ft. high); Hisiu, *Carr 11390*, Feb. 1935, sea-level, open sandy places near sea-shore (up to 3 ft. tall) (herb. Canberra); Port Moresby, *C. T. White 38*, July 1918, wet swampy places by coast (rather glaucous foliage). Eastern Division: Domara R., *Brass 1592*, May 1926, sea-level, on muddy river bank.

SOLOMON ISLANDS: Bougainville: Karugu, Buin, *Kajewski 2285*, Oct. 1930, sea-level, in swamps close to the sea-shore, common (a plant up to 1 m. high, growing in very wet swampy places, leaves with fine serrate edges, light brown flower-heads, native name "mala-muk teraugow").

This widely spread species has in the literature of New Guinea usually been called *Cyperus pennatus* Lam. I am indebted to Dr. E. D. Merrill for a copy of the appropriate passages and a tracing of the plate connected with Houttyn's binomial. To Merrill's discussion of the name, l.c., it may be added that:

1. No name is directly connected with Houttyn's description of a plant on p. 68, but there is a marginal reference to Plaat LXXXVIII, fig. 1.
2. On p. [III] of this volume, in the explanation of the plates, the binomial *Cyperus Javanicus* is definitely applied to Plaat LXXXVIII, fig. 1, and reference is made to p. 68.
3. The plate consists of a very good figure of an inflorescence with an enlarged figure (marked *a*) of a spikelet. Reference to this "a" is made in the description.

The validity of the binomial appears to rest upon the association of the name in the explanation of the plate with either the figure or with the

description or with both. That is, the formal description of the species is divided into parts, each occurring in different disjunct places in the volume. It is questionable whether this is in strict accord with either the letter or the spirit of Art. 44: "The name of a species . . . is not validly published unless it is *accompanied* (1) by a description, . . . or (3) by a plate or figure showing essential characters" (italics mine).

Kükenthal, in Engl. Bot. Jahrb. 69: 257. 1938, refers *Carr 11390* to *C. pennatus* var. *Armstrongii* (Benth.) Kükenth., a combination made in Pflanzenr. 101 (IV. 20): 479. 1936, and based on *C. Armstrongii* Benth. Fl. Austral. 7: 289. 1878. Bentham cites four collections after his original description: Port Essington, *Armstrong;* Port Darwin, *Schultz 731;* Percy Islands, *A. Cunningham;* Rockingham Bay, *Dallachy.* Dallachy's specimens belong to *C. tetracarpus* Boeck. I have not certainly seen specimens of the other collections cited, though Domin in Biblioth. Bot. 85: 440. 1915 refers Cunningham's specimens to what is here called *C. javanicus* and *Schultz 731* to *Mariscus Armstrongii* C. B. Clarke. C. B. Clarke in Kew Bull. Add. Ser. 8: 17. 1908, describes *Mariscus Armstrongii* sp. n., citing "*Cyperus Armstrongii*, Benth. Fl. Austral. 7: p. 289, quoad *Armstrong*, n. 616." This had best be interpreted as typifying Bentham's species on Armstrong's plant and then transferring the species in its emended sense to *Mariscus*.* In any case, I do not see how Carr's immature specimen in herb. Canberra can be distinguished from *C. javanicus*.

Cyperus Holoschoenus R. Br. Prodr. 215. 1810; Kükenth. in Engl. Bot. Jahrb. 70: 463. 1940.

Cyperus Holoschoenus R. Br. var. *fusci-squamatus* Kükenth. in Bull. Jard. Bot. Buitenz. sér. III, 16: 301. 1940.

PAPUA: Western Division: Dagwa, Oriomo R., *Brass 5920*, Feb.-March 1934, alt. 40 m., shallow margins of a lagoon on savannah (tall sedge with shining somewhat scabrid leaves).

This collection is an isotype (or at least a haplotype) of Kükenthal's variety which is diagnosed with the words "Culmus 70 cm. altus. Squamae fuscae." It was also cited merely as *C. Holoschoenus* R.Br. by him in the same year in Engl. Bot. Jahrb. The material seen by me consists of one complete culm about 80 cm. long beneath the inflorescence with innovation shoots at the base and a second inflorescence with the upper part of the culm. The glumes appear to be dull brown, but under the microscope they are seen to be more or less variegated, varying from straw-brown to dull purplish brown. The colour of the glumes varies considerably, partly

* It might be argued that Clarke left under *Cyperus Armstrongii* the specimens which agreed with Bentham's description, i.e., Dallachy's specimens, which would then be regarded as the type of *Cyperus Armstrongii* Benth., synonymous with *C. tetracarpus* Boeck. He separated the discordant element which to him appeared to represent a new species and described it as *Mariscus Armstrongii* n. sp. The question, if of any real importance, cannot be settled without examining the specimens annotated by Clarke, though Domin's disposition of the specimens concerned probably follows that of Clarke in herb. Kew.

at least as the result of aging of the spikelet, as is well illustrated by some of my specimens from N. Queensland, while variations in conditions during the drying of specimens also produce variations in the colouration of the dried specimens.

Apart from Brass's specimens the species is known only from the far northern parts of Australia.

Cyperus cyperoides (L.) O. Ktze. Rev. Gen. Pl. 3 (2): 333. 1898; Kukenth. in Pflanzenr. 101 (IV. 20): 514. 1936; Ohwi in Bot. Mag. Tokyo 56: 201. 1942.
Scirpus cyperoides Linn. Mant. 2: 181. 1771.
Cyperus umbellatus (Rottb.) Benth. Fl. Hongk. 386. 1861, quoad syn.; sensu F. Muell. Pap. Pl. 2: 34. 1886; sensu K. Schum. & Hollr. Fl. Kaiser Wilhelmsl. 24. 1889; sensu K. Schum. in Warb. in Bot. Jahrb. 12: 264. 1891; non *Kyllinga umbellata* Rottb.
Cyperus cylindrostachys Boeck. in Linnaea 36: 383. 1870 (excl. syn.); K. Schum. in Engl. Bot. Jahrb. 9: 195. 1888; Valck. Suring. Nova Guin. Bot. 8: 700. 1912.
Mariscus Sieberianus Nees ex C. B. Clarke in Hook. f. Fl. Brit. Ind. 6: 622. 1893; Palla in Rechinger, Denkschr. Math.-Naturw. Kais. Akad. Wiss. Wien 89: 499. 1913.

PAPUA: Central Division: Kubuna, *Brass 5614*, Nov. 1933, alt. 100 m., common, bed gravel banks.

Widely spread in Africa, tropical and temperate Asia and Australia, and in the West Indies. In New Guinea previously known from Netherlands New Guinea, North-East New Guinea and from "Proclamation Creek" (F. Mueller, l.c.).

This widely spread species has been most commonly known as *C. umbellatus*. The combination is usually attributed to Bentham in Fl. Hongk. 386. 1861, though Kükenthal in Pflanzenr. 101 (IV. 20): 523. 1936 attributes it to C. B. Clarke in Jour. Linn. Soc. 20: 296. 1883. Bentham, l.c., founded the combination on "*Mariscus umbellatus* Vahl; Kunth Enum. ii. 118." The name *Mariscus umbellatus* Vahl, Enum. Pl. 2: 376. 1806, was based on *Kyllinga umbellata* Rottb. Descr. et Icon. 15, t. 4, fig. 2. 1773; this name is not cited by Bentham, probably for the reason explained on p. 20 of the preface: "With regard to the synonymy, I have thought it generally unnecessary to repeat that which is already detailed in the general works referred to in the case of each well-known species." In Fl. Austral. 7: 289. 1878, Bentham cites the name *C. umbellatus*, Benth. Fl. Hongk. 386 with *Kyllinga umbellata* Rottb. in the synonymy. There seems little doubt that Bentham, in the last analysis, in his own mind definitely based his combination on that of Rottboell's, and even excluding the reference in Fl. Austral. the combination would be valid according to some recent interpretations of Art. 37 of the International Rules of Nomenclature, as there is an implied, indirect reference to Rottboell (*see* Airy-Shaw in Kew Bull. 1938: 256, 1938, and Sprague, Kew Bull. 1939: 322–3. 1939). It is however illegitimate because of the earlier *C. umbellatus* Burm. f. Fl. Ind. 21, t. 9, fig. 1. 1768, and *C. umbellatus* Roxb. Fl. Ind. 1: 205. 1820. *Kyllinga umbellata* Rottb. was based on an African plant which is nowadays regarded as distinct from the form represented by the New Guinea plant. Vahl apparently did not

distinguish the two and this broadened concept was accepted by Kunth and Bentham. Thus Bentham's *name* belongs to the form described by Rottboell, but his *description*, ll.cc., refers to the form described by Linnaeus, Mant. 2: 181. 1771, as *Scirpus cyperoides*, now known as *Cyperus cyperoides* (L.) O. Ktze.

Subgen. **Kyllinga** (Rottb.) Valckenier Suringar

Cyperus melanospermus (Nees) Valck. Suring., Het Gesl. Cyp. in Mal. Archip. 50, t. 2, fig. 8. 1898; Kükenth. in Engl. Bot. Jahrb. 69: 257. 1938.
Kyllingia melanosperma Nees in Wight, Contr. Bot. Ind. 91. 1834.

NETHERLANDS NEW GUINEA: Balim R., *Brass 11818*, Dec. 1938, alt. 1600 m., deforested slopes, common on moist sandy soil. PAPUA: Central Division: Mafulu, *Brass 5336*, Sept.-Nov., 1936, alt. 1250 m., seepage on roadside, one locality; Isuarava, *Carr 15469*, Feb. 1936, alt. c. 4000 ft., open places (up to 6 ft. tall) (herb. Canberra).

Carr's collection was cited by Kükenthal, l.c., together with one of Clemens' from North-East New Guinea, the only other collection known from the island. The species ranges from west, central and south Africa through India and China eastwards and southwards to New Guinea. *Brass 11818* is an unusually small individual, the culms being only 15–27 cm. high.

Cyperus brevifolius (Rottb.) Hassk. Catal. Hort. Bogor. 24. 1844; Valck. Suring. in Nova Guin. 8: 696. 1912; Kükenth. in Pflanzenr. 101 (IV. 20): 600. 1936.
Cyperus brevifolius (Rottb.) Hassk. var. *stellulatus* Valck. Suring. Het Gesl. Cyp. in Mal. Archip. 48, t. 2, fig. 5. 1898; Kükenth., l.c., 603, in Engl. Bot. Jahrb. 69: 257. 1938.
Kyllinga brevifolia Rottb. Descr. et Icon. 13, t. 4, fig. 3. 1773; Palla in Rechinger, Denkschr. Math.-Naturw. Kais. Akad. Wiss. Wien 89: 500. 1913; Ridl. in Trans. Linn. Soc. II, Bot. 9: 241. 1916; Kükenth. in Engl. Bot. Jahrb. 59: 42. 1924; H. J. Lam in Nat. Tijdschr. Ned. 88: 272. 1928.
Kyllinga brevifolia Rottb. var. *stellulata* (Valck. Suring.) Ohwi in Bot. Mag. Tokyo 56: 199. 1942.

NETHERLANDS NEW GUINEA: 4 km. SW. of Bernhard Camp, Idenburg R., *Brass 13256*, March 1939, alt. 850 m., rain-forest, gregarious on sandy beaches in river; 9 km. NE. of Lake Habbema, *Brass 10730*, Oct. 1938, alt. 2800 m., erect in dense clumps on a native clearing in forest; same locality and date, *Brass 10739*, on native clearing in forest. PAPUA: Western Division: Gaima, Lower Fly R. (east bank), *Brass 8303*, Nov. 1936, sporadic on open sandy foreshores. Central Division: Kubuna, *Brass 5687*, Nov. 1933, alt. 100 m., common, river bottom sandbanks.

Almost cosmopolitan, but not previously recorded for Papua.

Cyperus brevifolius var. *stellulatus* (*Kyllinga intermedia* R.Br.) comprises individuals with smooth, not spinulose keels to the glumes. Neither this nor the other characters enumerated by Kükenthal, l.c., are in any way constant and occur in varying combinations. I have found glumes with smooth keels and spinulose keels on the same plant.

Cyperus Kyllingia Endl. Catal. Hort. Acad. Vindob. 1: 94. 1842; Kükenth. in Pflanzenr. 101 (IV. 20): 606, fig. 64, C D. 1936; Fosberg in Lloydia 3: 111. 1940.
Cyperus Kyllingia Endl. f. *humilis* (Boeck.) Kükenth., l.c., 608. 1936.
Cyperus Kyllingia Endl. f. *subtriceps* (Kunth) Kükenth., l.c., 608. 1936.
Cyperus monocephalus (Rottb.) F. Muell. Fragm. 8: 271. 1874; Valck. Suring. in Nova Guin. Bot. 8: 695. 1912, non Roxb.

Kyllinga monocephala Rottb. Descr. et Icon. 13, t. 4, fig. 3. 1773; F. Muell. Pap. Pl. 1: 31. 1876; Becc. in D'Albertis, New Guinea 2: 399. 1880; Guppy, Solomon Islands and Natives 304. 1887; K. Schum. in Engl. Bot. Jahrb. 13: 265. 1891, in Notizbl. Bot. Gart. Mus. Berlin 1: 47. 1895, 2: 96. 1898; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 194. 1900; Palla in Rechinger, Denkschr. Math.-Naturw. Kais. Akad. Wiss. Wien 89: 499. 1913; Ridl. in Trans. Linn. Soc. II, Bot. 9: 241. 1916; Kükenth. in Engl. Bot. Jahrb. 59: 41. 1924; Ohwi in Bot. Mag. Tokyo 56: 199. 1942.

Kyllinga monocephala Rottb. var. *mindorensis* Boeck. in Linnaea 35: 428. 1868; K. Schum. & Hollr. Fl. Kaiser Wilhelmsl. 24. 1889.

Kyllinga monocephala Rottb. f. *subtriceps* Kunth, Enum. Pl. 2: 130. 1837; Kükenth. in Engl. Bot. Jahrb. 59: 42. 1924.

PAPUA: Western Division: Daru Island, *Brass 6401*, March 1936, common on wet ground (inflorescence white) (det. Kükenthal). Central Division: Baroka, Mekeo District, *Brass 3746*, April 1933, alt. 30 m., common, banks of small creek in rain forest (flower heads white); Budatobara, *Brass 700*, Dec. 1925, alt. 300 ft., wet creek-banks.

SOLOMON ISLANDS: San Cristobal: Waimamura, *Brass 2803*, Sept. 1932, alt. 0 m., common, a weed on garden pathways (inflorescence white).

Pantropical. It seems superfluous and misleading to distinguish nomenclaturally such states as f. *humilis* and f. *subtriceps*. The former refers to depauperate specimens and the latter to robust states. *Brass 3746* shows the "typical" form and f. *subtriceps* on the same rhizome and *Brass 6401* is not very different.

Subgen. **Torulinium** (Desv.) Kükenthal

Cyperus ferax L. C. Rich. in Act. Soc. Hist. Nat. Paris 1: 106. 1792; Warb. in Engl. Bot. Jahrb. 18: 180. 1893; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 194. 1900; Kukenth. in Engl. Bot. Jahrb. 59: 46. 1924, in Pflanzenr. 101 (IV. 20): 615. 1936, fig. 6, K-P. 1935; Ohwi in Bot. Mag. Tokyo 56: 201. 1942.

?*Cyperus novae-hannoverae* Boeck. in Engl. Bot. Jahrb. 5: 91. 1884; Valck. Suring. in Nova Guin. Bot. 8: 701. 1912.

?*Cyperus ferax* L. C. Rich. var. *novae-hannoverae* (Boeck.) Kükenth. in Engl. Bot. Jahrb. 59: 4, 46. 1924; in Pflanzenr. 101 (IV. 20): 618. 1936.

Torulinium ferax (L. C. Rich.) Urban, Symb. Antill. 2: 165. 1900; Palla in Rechinger, Denkschr. Math.-Naturw. Kais. Akad. Wiss. Wien 89: 499. 1913.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg R., *Brass 13790*, April 1939, alt. 50 m., on logs floating in oxbow lakes and backwaters. PAPUA: Central Division: Ihu, Vailala R., *Brass 1015*, Feb. 1926, alt. 0 m., sago-swamp borders.

In Pflanzenr. 101 (IV. 20): 618. 1936, Kükenthal cites *Brass 1015* under *C. ferax* var. *novae-hannoverae* and it is on this authority that I have suggested treating *C. novae-hannoverae* Boeck. as synonymous with *C. ferax*. *Brass 1015* is a decidedly immature specimen.

Eleocharis R. Brown

Eleocharis fistulosa Link in Spreng. Jahrb. 3: 78. 1820.

PAPUA: Western Division: Dagwa, Oriomo R., *Brass 6010*, Feb.-March 1934, alt. 45 m., erect soft-textured sedge in shallow margins of a lagoon on savannah, uncommon.

New for New Guinea. A widely spread but apparently uncommon species known from Africa, S. and E. Asia, NE. Australia and from Mexico

and the West Indies to Argentina.

Eleocharis laxiflora (Thwaites) H. Pfeiff. in Mitt. Inst. Bot. Hamburg 7: 169. 1928.
Scirpus laxiflorus Thw. Enum. Pl. Zeyl. 435. 1864.
Eleocharis variegata (Poir.) Presl var. *laxiflora* (Thwaites) C. B. Clarke in Hook. f. Fl. Brit. Ind. 6: 626. 1893; Kükenth. in Engl. Bot. Jahrb. 59: 47. 1924; 69: 257. 1938 (as *Heleocharis*).

PAPUA: Western Division: Lake Daviumbu, Middle Fly R., *Brass 7630*, August 1936, scattered among coarse sedges, etc., of floating islands (det. Svenson).

New for Papua. Previously known from North-East New Guinea to India and from Micronesia and Polynesia.

Eleocharis dulcis (Burm. f.) Trin. ex Henschel, Vita Rumph. 186. 1833; Svenson in Rhodora 41: 11. 1939.
Andropogon dulce Burm. f. Fl. Ind. 219. 1768.
Eleocharis plantaginea (Retz.) R. & S. Syst. 2: 150. 1817; K. Schum. in Notizbl. Bot. Gart. Mus. Berlin 2: 97. 1898; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 195. 1900; Valck. Suring. in Nova Guin. Bot. 8: 702. 1912 (all cited as *Heleocharis plantiginea* R. Br.).

PAPUA: Western Division: Mainland opposite Daru Island, *Brass 6064*, March 1934, dominant plant in large coastal swamp (stems cylindrical, shining dark green); Daru Island, *Brass 6288*, March 1936, extensive pure bright green even stand surrounding central open water of large swamp (plant + 60 cm. high, half below water-level); coast between Oriomo and Fly Rivers, *Brass 6467*, April 1936, extensive pure stand filling freshwater swamp. Central Division: Isuarava, *Carr 15619*, Feb. 1936, alt. c. 4000 ft., damp places in the open (used by Biagi people in making skirts for their women; Biagi name: lorio) (herb. Canberra); Boridi, *Carr 12992*, Sept. 1935, alt. c. 4500 ft., source of stream in forest clearing (herb. Canberra).

The species extends from SE. Asia to Madagascar, Australia and Fiji. Brass's specimens had been previously determined by Svenson. Carr's specimens were referred to "*Heleocharis equisetina* Presl" by Kükenthal in Engl. Bot. Jahrb. 69: 257. 1938, but well-developed specimens of *E. equisetina* are distinguishable by having firmer culms, firmer, broader, shorter, subtruncate (not rounded), more or less shining glumes which are somewhat incurved when dry, hypogynous bristles more slender and quite free from one another (not conspicuously connate at the base), long-apiculate anthers, and bright-brown nut with acutely costulate margins and more regularly arranged external cells. But Carr's specimens are not very satisfactory and are in flower only.

Eleocharis spiralis (Rottb.) R. & S. Syst. 2: 155. 1817.
Scirpus spiralis Rottb. Descr. et Icon. 45. t. 15, f. 1. 1773.

PAPUA: Western Division: Daru Island, *Brass 6287*, March 1936, forms extensive practically pure stands, 50–60 cm. high in shallow swamp margins (det. Svenson).

New for New Guinea; elsewhere known from Mauritius, Madagascar, SE. Asia, Borneo, Philippine Islands, NE. Australia and New Caledonia.

Eleocharis pellucida Presl, Rel. Haenk. 1: 196. 1830.

NETHERLANDS NEW GUINEA: 9 km. NE. of Lake Habbema, *Brass 10729*, Oct. 1938, alt. 2800 m., abundant in a clearing surrounding a native house in the forest.

New for New Guinea. Previously recorded from SE. Asia to Borneo and the Philippine Islands.

Bulbostylis Kunth

Bulbostylis barbata (Rottb.) C. B. Clarke in Hook. f. Fl. Brit. Ind. 6: 651. 1894; K. Schum. & Lauterb. Nachtr. Fl. Deutsch. Schutzgeb. Südsee 59. 1905; Kukenth. in Engl. Bot. Jahrb. **59**: 51. 1924, **69**: 258. 1938.

Isolepis barbata (Rottb.) R. Br. Prodr. 222. 1810; F. Muell. Pap. Pl. 1: 46. 1876.

Fimbristylis barbata (Rottb.) Benth. Fl. Austral. 7: 321. 1878; Valck. Suring. in Nova Guin. Bot. 8: 704. 1912.

PAPUA: Western Division: Daru Island, *Brass 6385*, March 1936, a wet seasonal ephemeral common on patches of hard compacted soil (det. Uittien as *Fimbristylis barbata*). Central Division: Rona, Laloki R., *Brass 3575*, alt. 450 m., April 1933, common on flat rock surfaces.

Cosmotropical. The authorship of the combination under *Bulbostylis* is usually credited to Kunth, Enum. 2: 208. 1837, but it was first formally made by C. B. Clarke, l.c.

Specimens of this species were erroneously referred to *Scirpus setaceus* L. by K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 195. 1900.

Bulbostylis barbata f. *paupercula* Kükenth. in Engl. Bot. Jahrb. 70: 463. 1940, is evidently based on small plants with 1–2 spikelets. Such reduced states are frequently met with in annual members of the family and it seems quite unnecessary to distinguish them nomenclaturally.

Fuirena Rottboell

Fuirena umbellata Rottb. Descr. et Icon. 70, t. 19, fig. 3. 1773; F. Muell. Pap. Pl. 2: 18. 1885; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 194. 1900; Valck. Suring. in Nova Guin. Bot. 8: 706. 1912; Kükenth. in Engl. Bot. Jahrb. **59**: 52. 1924.

PAPUA: Western Division: Lake Daviumbu, Middle Fly R., *Brass 7632*, Aug. 1936, sporadic on floating islands and marshy shores of lake (det. Uittien); Gaima, Lower Fly R. (east bank), *Brass 8258*, Nov. 1936, common in swampy watercourses in savannah forest; Wuroi, Oriomo R., *Brass 5747*, Jan.-March 1934, alt. 10–20 m., straggling on a coarse sedge formation in a small swamp on savannah (stem 5-angled); Mabaduan, *Brass 6540*, April 1936, mixed with grasses in shallow rain-pools in savannah forest (det. Uittien).

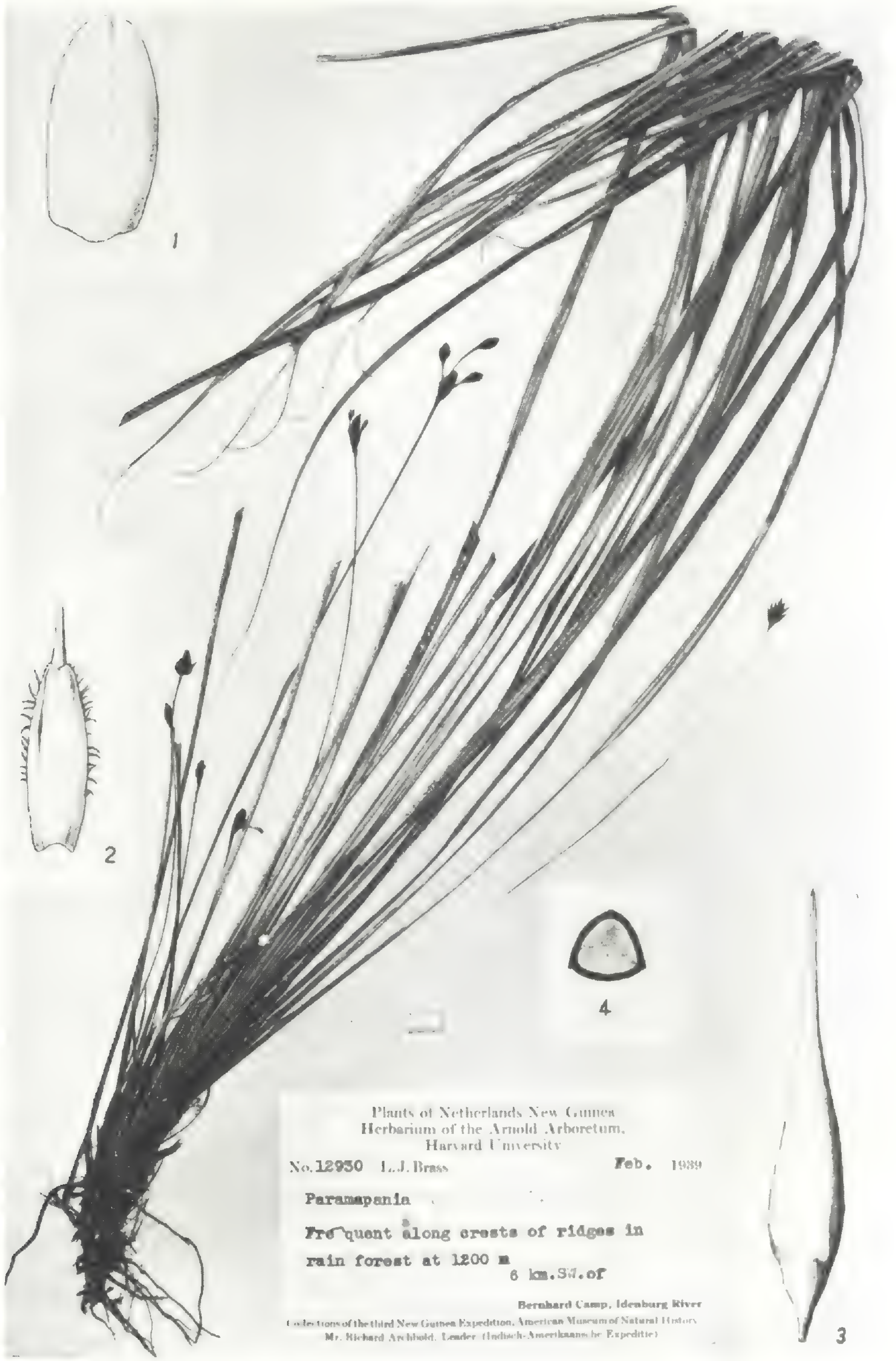
Lipocarpha R. Brown

Lipocarpha microcephala (R. Br.) Kunth, Enum. 2: 268. 1837; F. Muell. Pap. Pl. 2: 34. 1886; Kükenth. in Engl. Bot. Jahrb. 59: 51. 1924; Ohwi in Bot. Mag. Tokyo 56: 204. 1942.

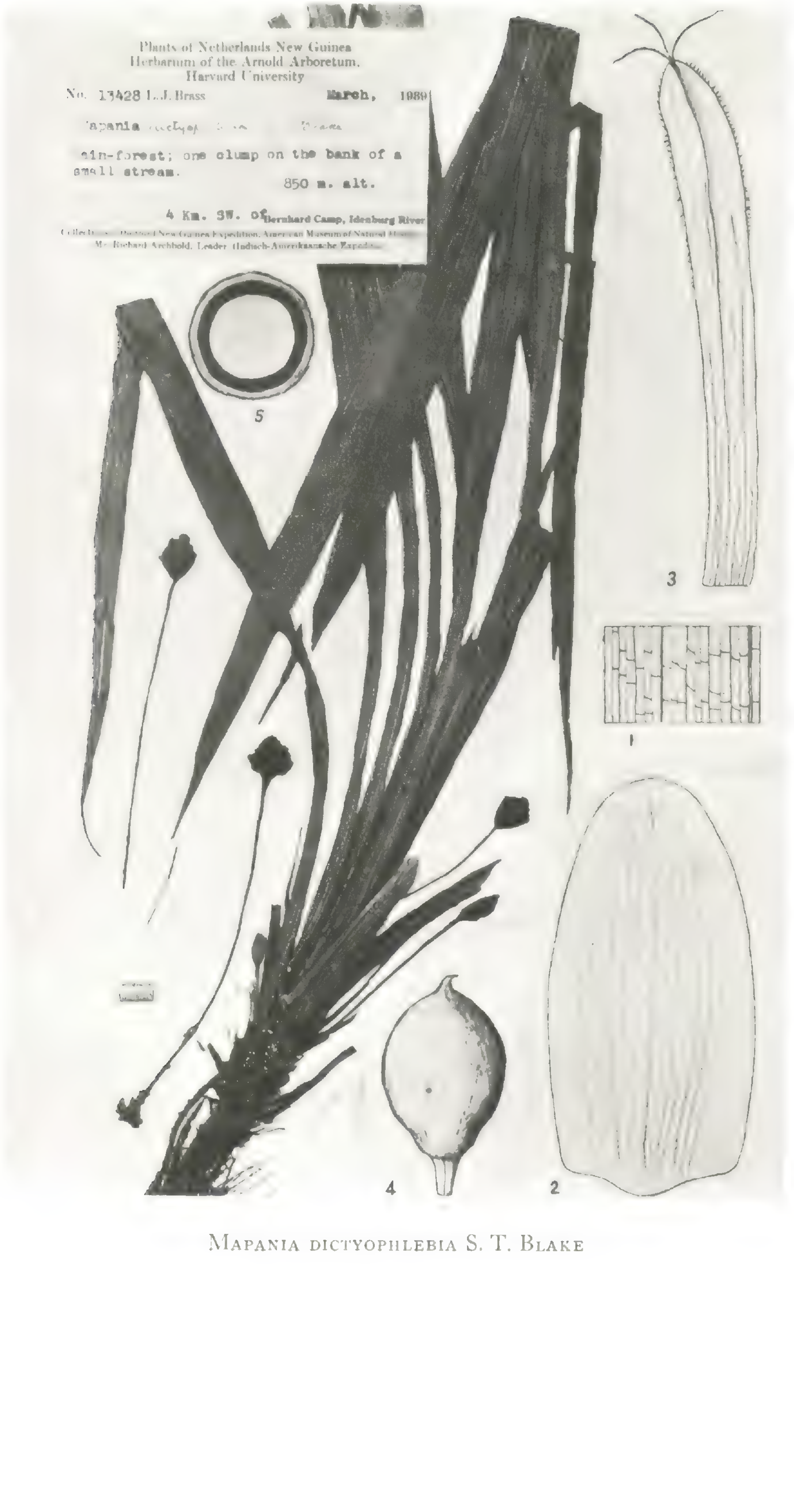
Hypaelyptum microcephalum R. Br. Prodr. 220. 1810.

PAPUA: Western Division: Daru Island, *Brass 6246*, March 1936, sporadic in damp soil of savannah forests (det. Uittien).

The species extends from Australia to tropical Asia. This is the first definite locality recorded for Papua. F. Mueller, l.c., and Domin in Biblioth. Bot. 85: 468. 1915 ascribe the combination *Lipocarpha microcephala* to R. Brown in Tuckey's Narr. Exped. Congo 459. 1818; but Brown made no such combination. The pertinent passage reads: "*Hypaelyptum argenteum* . . . is also in the collection. The name *Hypaelyptum*, under which I have formerly described the genus that includes *H. argenteum*[3] . . . " with a footnote reference to "*Prodr. Flor. Nov. Holl.* 1, *p.* 225."



PARAMAPANIA ATTENUATA S. T. BLAKE



MAPANIA DICTYOPHLEBIA S. T. BLAKE

Lipocarpha senegalensis (Lam.) Dandy in Jour. Bot. 70: 331. 1932, with full synonymy; Ohwi in Bot. Mag. Tokyo 56: 204. 1942.

Scirpus senegalensis Lam. Tabl. Encycl. 1: 140. 1791.

Lipocarpha argentea (Vahl) R. Br. ex Nees in Linnaea 9: 287. 1835; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 197. 1900; Valck. Suring. in Nova Guin. Bot. 8: 706. 1912; Kükenth. in Engl. Bot. Jahrb. 59: 51. 1925; 69: 259. 1938.

Netherlands New Guinea: Balim R., *Brass 11740*, Dec. 1938, alt. 1600 m., occasional on grassy long deforested slopes; 9 km. NE. of Lake Habbema, *Brass 10741*, Oct. 1938, alt. 2800 m., plentiful on a native clearing in the forest, pale greenish clumps 40–50 cm. high.

Ranges over tropical Africa, tropical Asia and tropical Australia. Previously recorded by Valckenier Suringar and Kükenthal, ll.cc., for New Guinea under the name of *L. argentea*. The rather complicated synonymy is discussed by Dandy, l.c.

EXPLANATION OF PLATES

Plate I.

Paramapania attenuata S. T. Blake. Type-specimen × ½ with analytical drawings. Fig. 1. Glume. Fig. 2. Flower with developing ovary; stamens fallen away. Fig. 3. Nut. Fig. 4. Transverse section of nut. All figures × 10.

Plate II.

Mapania dictyophlebia S. T. Blake. Type-specimen × ½ with analytical drawings. Fig. 1. Portion of leaf, × 3. Fig. 2. Glume. Fig. 3. Flower, the stamens fallen away. Fig. 4. Nut. Fig. 5. Transverse section of nut. Figs. 2 – 5 × 8.

Analytical drawings by S. T. Blake, Photography by W. J. Sanderson.

Queensland Herbarium,
Brisbane, Queensland, Australia.

NEW AND NOTEWORTHY CHINESE FAGACEAE

WOON-YOUNG CHUN

Lithocarpus brachystachya, n. sp.

Frutex 3–5 m. altus breviramosus dense foliosus; ramuli hornotini annotinique gracillimi subteretes flavo-brunnescentes obscure sublepidoti cito glaberrimi, vetustiores fusco-cinerescentes. Folia sempervirentia tenuiter coriacea integra elliptica utrinque attenuata, 5–7 cm. longa 1.5–2.5 cm. lata, apice abrupte caudata acumine 1–1.5 cm. longo angusto falcato obtuso, basi oblique cuneata, supra glabra atroviridia nitida siccitate flavo-brunnescentia costa plana nervis obsoletis, subtus discoloria viridi-albescentia costa elevata nervisque primariis lateralibus gracilibus flavescentibus sub lente minute farinaceo-tomentellis circiter 8 sub angulo 50° egressis intra marginem curvatis evanescentibus; petioli circ. 5 mm. longi supra late sulcati parcissime farinaceo-tomentelli demum glabri. Amenta utriusque sexus pauca ad apices innovationum et in axillis foliorum superiorum enata foliis breviora, pauciflora erecta rhachidibus gracilibus angulatis cum alabastris minute pulverulento-albido-puberulis, floribus singulis remotis. Amenta masculina simplicia stricta; bracteae subulatae parvae; flores numquam ultra 30 sessiles; perianthium cupuliforme alte connatum lobis 6 triangulari-ovatis acutis brunneis glabrescentibus; stamina 12 longe exserta, circ. 2.2 mm. longa; antherae ellipsoideae apiculatae; ovarii rudimentum magnum globosum albo-tomentosum. Spicae femininae 3 9-florae erectae solitariae, interdum spicis nonnullis ex axillis bractearum paniculatim aggregatis patentibus; flores parce lepidotuli stipitati stipitibus initio pulviniformibus post anthesin accrescentibus usque ad 2 mm. longis; perianthium cupulatum denticulatum dentibus 6 minutis. Spica fructifera in parte superiorem ramuli annotini lateralis usque ad 5 cm. longa, rhachi tenuia cinerea pulverulento-lepidotula; fructus biennes stipitati solitarii raro 2–3 distantes; cupula patelliformis basi truncata, crasse coriacea fragilis, 14 mm. lata 4 mm. alta, intus griseo-purpurascens puberula, extus cinereo-lepidotula squamis in zonis concentricis obsoletis confluentibus apicibus minute apiculato-denticulatis adpressis glabrescentibus tantum distinctis; glans pro maxima parte exserta ovoideo-turbinata apice attenuata breviter apiculata basi truncata, 12 mm. lata umbone incluso 14 mm. alta initio pruinosa cito glabrata lucida atrobrunnea; cicatrix alte concava 6–8 mm. diametro.

HAINAN: Kan-En Hsien, Hao-Pi Ling, shrub 4 m. tall, in dense woods, Aug. 7, 1936, *S. K. Lau 27634;* Chun-Pai Ling, top of mountain, tree 5 m. tall, in light woods, Oct. 23, 1933, *H. Y. Liang 63718* (TYPE), *63723;* Erh-Fang Ling, top of mountain, tree or shrub 4 m. tall, in woods, Nov. 7, 1933, *H. Y. Liang 63686, 63687;* Erh-Huang Shan, Heng-Po Po, near the peak, tree 20 m. tall, in shaded woods, April 25, 1934, *H. Y. Liang 65268, 66272.*

This species is characterized by small leaves, short flowering and fruiting spikes, and small segregated pedicellate fruits with a shallow fragile cup marked by the minutely denticulate apices of the scales.

Lithocarpus cyrtocarpa (Drake del Castillo) Chun, comb. nov.

Quercus (Pasania) *cyrtocarpa* Drake del Castillo in Jour. de Bot. 4: 150, *pl. 3. fig. 3.* 1890.

Pasania cyrtocarpa (Drake del Castillo) Hickel et A. Camus in Ann. Sci. Nat. Bot. Sér. 10, 3: 408. 1921, in Lecomte, Fl. Gén. Indo-Chine 5: 1003. 1930.

AD DESCRIPTIONEM ADDENDA:

Arbor 5–12 metralis cortice cinereo ramis ramulisque satis gracilibus teretibus griseo-cinereis crebre lenticellatis primo parce fulvo-tomentosis mox glabratis, gemmis nondum satis evolutis 4 mm. longis ovoideis obtusis adpresse sericeis. Folia per duos annos persistentia brevipetiolata tenuiter coriacea elliptica elliptico-oblonga vel ovato-lanceolata, 5 15 cm. longa 2 4.5 cm. lata, plerumque leviter inaequilateralia breviter sensim vel abruptius acuminata, basi late cuneata vel obtusa, supra costa impressa sordide tomentosa excepta glabra laete viridia lucida crebre venulosa venulis transversis sub lente dense foveolatis, subtus pallidiora in nervis et costa elevata densius in facie sparse fasciculato-pilosa pilis minimis breviradiatis mox evanescentibus, margine integerrima vel crenulata aut apicem versus utrinque denticulis porrectibus distantibus interdum ad callos reductis 4–7 instructa, nervis lateralibus pleraque 13 sub angulo 40° divergentibus sursum curvatis trabeculis numerosis tenuissimis conjunctis, petiolis 5–15 mm. longis tomentosis. Fructus biennis solitarius sessilis ramum anni prioris insidens; cupula plano-scutelliformis circiter usque ad 4 cm. lata crasse lignosa, intus umbilico valde elevato excepta molliter fulvo-velutino-sericea, extus dense squamosa squamis perpendiculariter ortis e basi lata tumida conico-pyramidatis sursum angustato-curvatis intimis majoribus validis ± 3 mm. longis extrinsecus gradatim minoribus extimis minimis aculeiformibus omnes fulvo-tomentosis; glans basi cupulae solum adnata, discoidea vel depresse globosa, 4–4.5 cm. lata 2 cm. alta, atrocastanea apice plana centro paulo depresso conico-umbonata ubique fulvo-tomentosa pilis minimis fasciculatis conglutinatis facile detersis; cicatrix concava pallida rugulosa, 2.6–3.6 cm. diam.

KWANGSI: S. Nan-Ning, Shi-Wan-Ta Shan, alt. 900 m., tree 10 m. tall, in open woods by stream, bark dark gray, branchlets tomentose, gray, leaves thin, pale green beneath, scales brown reflexed, Oct. 21, 1928, *R. C. Ching 8111;* same district, Me-Kong, tree 12 m. tall, leaves smooth green above light green beneath, fruit large brown, compressed, edible, rare, Nov. 3, 1928, *R. C. Ching 8345.* KWANGTUNG: Yang-Chun Hsien, Chin Shan, tree in mixed woods, bark gray, Nov. 15, 1935, *C. Wang 38773.*

DISTRIBUTION: Tonkin; New to China.

Lithocarpus dictyoneura, n. sp.

Arbor 18 metralis partibus junioribus inflorescentiisque dense fulvo-floccoso-pilosis, ramulis angulatis gracilibus cito glabrescentibus, ramis teretibus fusco-nigris fere levibus glabratis. Folia persistentia subcoriacea vulgo 10–16 cm. longa et 4–6 cm. lata, maxima 16–25 cm. longa 6–9 cm. lata, prope verticem abrupte caudata acumine falcato angusto 1–2.5 cm. longo, e medio desuper attenuata basi ipsa cuneata, margine subtiliter recurva, supra atro-viridia nitida in sicco atrobrunnea, subtus pallidiora siccitate flavescentia glaberrima, costa media utrinque elevata, nervis utrinsecus 16–20 adscendentibus ante marginem confluentibus cum trabeculis transversis distinctissimis supra insculptis subtus valde elevatis; petioli crassi late sulcati puberuli vix ultra 1 cm. longi; stipulae adpresse

pilosae inferiores ovato-lanceolatae superiores angustiores. Amenta erecta ex axillis foliorum bractearumque in partibus terminalibus ramulorum anni paniculatim aggregata, dense crispato-pilosa pilis fulvis fasciculatis, superiora nonnulla feminea; ♂ 9–15 cm. longa densiflora, rhachidibus gracilibus angulatis florum fasciculis 3-floris inferne dissitis superne approximatis, bracteis 3 triangulari-ovatis acuminatis majora 2 mm. longa, lobis perianthium fere ad basin divisis, staminibus 12 longe exsertis, antheris cordato-ovatis minute apiculatis basi discretis, pistillo rudimento liberi piloso; ♀ 10–18 cm. longa, pauciflora florum fasciculis dispersis 3–5-floris, bracteis lineari-subulatis 1.5 mm. longis, stylis 3 conico-subulatis glabris. Spicae fructiferae in parte superiore ramulorum annotini laterales rhachidibus ramulis aequicrassis 10–16 cm. longis nigris lenticellatis parce puberulis. Fructus biennes sessiles conferti sed vix confluentes glomerulis florum abortivorum interspersi; cupula firme coriacea fragilis circiter 10 cm. lata, nunc cupuliformis dimidio glandem cincta 5–6 mm. alta, nunc depresse hemisphaerica ore leviter contracto glandem (vertice exposito excepto) subinclusa circiter 10–12 mm. alta, intus glabra purpurascens, extus furfuraceo-lepidotula squamis permultis parvis spiraliter confluentibus apicibus triangularibus acutiusculis curvatis adpressis tantum distinctis; glans subglobosa vel conico-hemisphaerica initio pruinosa mox nitida apice stylopodio rotundato umbonata; cicatrix leviter impressa 10–12 mm. diametro.

KWANGSI: Yao Shan, collected under the direction of S. S. Sin, May 24, 1928, *No. 31*; Lo-Hsiang, Nov. 22–25, 1928, *Nos. 3639, 3667* (TYPE); without data, *R. C. Ching 7391*.

This species falls into the group of *Lithocarpus fenestrata* (Roxb.) Rehder from which it differs in thinner leaves with more numerous and unusually prominent, strongly etched lateral veins and veinlets, smaller cups with minute scales, and hemispheric, not ovoid acorns. *Lithocarpus Paviei* (Hick. et A. Camus) Chun* is not unlike in certain respects but in that species the silky pilose acorn is borne on a pedicellate cup.

Lithocarpus Elmerrillii, n. sp.

Lithocarpus silvicolarum (Hance) Chun in Jour. Arnold Arb. 9: 152. 1928; pro parte, quoad descr. foliorum.

Arbor 12–25 metralis fere omnino glabra cortice pallide brunneo ramulis gracilibus angulatis sulcatis fulvo-cinereis in anno secundo satis incrassatis subteretibus obtuse angulatis; gemmae ellipsoideae obtusae brunneae 4–5 mm. longae perulis praesertim interioribus pilosis. Folia biennia longipetiolata, modice coriacea elliptica vel elliptico-oblonga, 7–15 cm. longa 2.5–6 cm. lata, utrinque longe attenuata sursum in caudam falcatam acutam 1–1.5 cm. longam plus minusve subito protracta basi oblique cuneata in petiolo complanato 1.5–3 cm. longo anguste decurrentia, pagina superiora laete viridia nitida inferiora glauca, costa media tenuis supra plana subtus elevata nervis utrinsecus 8–11 subangulo 45° egressis curvatis ante marginem dissolutis subtus moderanter eminentibus venulis transversis supra tantum leviter distinctis. Flores non visi. Spica feminina (tempore fructu) 2–7 cm. longa lenticellata in parte superiore

* **Lithocarpus Paviei** (Hick. et A. Camus) Chun, comb. nov.

Pasania Paviei Hickel et A. Camus in Bull. Mus. Hist. Nat. Paris 29: 603. 1923.

ramulorum annotinorum eios validior subterminales superne flores abortivos dissitos paucos fructum maturum unicum gerens. Fructus biennis sessilis; cupula hemisphaerica, 8–10 mm. alta, pro maxima parte corporis solida vertice vacuo tenui patelliformi 15–24 mm. lato basin glandis solum sustinens, intus sericeo-puberula, extus dense griseo-lepidotula verticellatim squamosa squamis circ. 10-serialibus crebris adpressis inferioribus et mediis ovatis dorso gibboso-convexis mucronatis vel muticis, superioribus latissime deltoideis mucrone brevi-acuminato subglabro terminantibus; glans pro maxima parte exserta ovoidea vel subglobosa castanea glabra nitida, 18–24 mm. alta, apice attenuata umbonata basi truncata; cicatrix profunde concava circ. 2 mm. alta 12–14 mm. diam.

HAINAN: Pao-Ting Hsien, Hsing-Lung, Hsuang-Chi-Na, alt. about 1000 m., tree 12 m. tall, in forests, bark brown, leaves glaucous beneath, Sept. 1, 1935, *F. C. How 73585* (TYPE); same locality, tree 25 m. tall, Sept. 5, 1935, *F. C. How 73637;* Five Finger Mt., Fan-Ya, Dec. 16, 1921, *F. A. McClure 8596.*

The last named specimen, a duplicate of which was presented to the Herbarium of the Botanical Institute, Sun Yatsen University, by Mr. H. Green, late Superintendent of the Hongkong Botanical Garden, had been misidentified as *Quercus silvicolarum* Hance, a very different plant with a thin, fragile cup described by Hance as "cupulis cupuliformibus 10 lin. diametro squammis brunneis tomentellis in lamellas 6 indistinctas denticulatas connatis." The description of the leaves accompanying the new combination under *Lithocarpus*, cited above, is unfortunately based on McClure's specimen which rightly belongs to the new species now proposed. The new species is named after Dr. Elmer D. Merrill, my mentor for over twenty years.

Lithocarpus Haipinii, n. sp.

Arbor 10–12 m. alta cortice levi obscure cinereo; ramuli valdi, circiter 8 mm. diametro, dense molliter initio laete cito sordide fulvo-tomentosi, in anno tertio glabrati griseo-corticati rugulosi foliorum delapsorum cicatricibus magnis deltoideo-ovatis notatis. Folia per duos annos persistentia crasse coriacea bullata elliptica vel obovato-elliptica, 8–12 cm. longa 3.5–7 cm. lata, apice abrupte acuminata acumine lato acuto falcato ± 1 cm. longo, basi rotundata vel late obtusa, margine satis recurva, supra olivacea lucida praeter costae partem inferiorem sordide tomentosam glabra, subtus pallidiora, sicca utrinque brunnescentia, ubique costa venisque magis fasciculato-pilosula, costa subtus elevata e basi lata sursum gradatim attenuata nervis secundariis utroque latere 11–12 tenuibus prope marginem curvatis trabeculis transversis utrinque prominentibus supra quam subtus densioribus conjunctis; petiolus teres 2–3 cm. longus indumento ut in ramulis. Flores ♂ non satis evoluti ex axillis foliorum superiorum anguste paniculati in ramis abbreviatis perpaucis circiter 2–5 cm. longis densifloris sessiles, omnibus partibus molliter tomentosis, bracteis lanceolatis subulatis suffultis. Spicae ♀ in parte superiorum ramulorum terminales erectae rigidae 6–13 cm. longae dense fulvo-tomentosae florum fasciculis inferne dispersis superne approximatis; flores 3–5 fasciculati, juveniles haud visi. Fructus biennes in rhachidibus ramulis anni secundi conformibus aequicrassis longitudinaliter striolatis 12–16 cm. longis 2–7, sessiles congesti sed haud confluentes circa basin

fructibus abortivis dense spinuloso-squamosis cupulae adnatis; cupula cupuliformis lignosa, 0.6 cm. alta 2.2 cm. lata, glandem basi tantum cincta, intus pupurascens circa cicatricem circularem elevatam obscure puberula alibi glabra, extus dense fulvo tomentosa squamis annulatim confluentibus partibus liberis acicularibus reflexis curvatis interdum subtiliter hamatis 6 mm. longis conspicue ornata; glans pro maxima parte exserta turbinata raro ovoideo-globosa, apice umbonata, basi truncata, 2.2–2.5 cm. lata, atrocastanea glabra nitida initio glaucescentia; cicatrix profunde excavata pallida impolita, 12 mm. diametro.

HONGKONG: The Peak above Luggard Road in a ravine, tree 10 m. tall, 40 cm. diam., bark deep gray, leaves very thick, lustrous, pale green beneath, May 19, 1930, *C. L. Tso 21690;* July 2, 1930, *C. L. Tso 21838*, Sept. 9, 1930, *C. L. Tso 22580* (TYPE); in dense wood on slope, tree (past flowering), branching near the base into 5 stems, bark gray smooth, branchlets gray, young shoots densely fulvous pubescent, leaves deep lustrous green bullate, Aug. 18, 1933, *W. Y. Chun 9159;* mature fruits, Sept. 5, 1934, *W. Y. Chun 10020.* KWANGTUNG: Yiao-Ping, Phoenix Mountain, tree 5–10 m. tall, in forest, branchlets brownish tomentose, staminate inflorescence in bud paniculate, April 16–21, 1931, *N. K. Chun 42680, 42743;* Hsin-I District, Ho-Sui, Mu-Lan Tsai, tree 14 m. tall, in mixed forests, spines of involucre green, Aug. 16, 1931, *C. Wang 31171, S. P. Ko 51794;* same district Yiang Chai, Hou Shan, alt. 1200 m., tree 1 m., young inflorescence, April 9, 1932, *C. Wang 32055;* Nov. 22, 1934, *C. Wang 37958;* Yu-Yuen District, Ti-Hsia Shan, tree 6 m. tall, in mixed woods, young inflorescence, April 23, 1934, *S. P. Ko 88595;* Tai-Pu District, Tung-Ku Shan, Sept. 8–29, 1932, *W. T. Tsang 21627.* KWANGSI: Ping-Nan, Yao-Shan, Pai-Niu, large tree, on peak in mixed forests, flowers white, May 20, 1936, *C. Wang 39183.*

The acicular reflexed squamae on the fruiting involucre approximate those of *Lithocarpus Garrettiana* (Craib) Chun* and *Lithocarpus Skanniana* (Dunn) Rehd., but in other respects, this new species is totally different from the plants mentioned.

This truly remarkable large handsome tree was first discovered by the writer, when he was about to embark for England in 1930, in Hongkong near the Peak in a small wood behind a residence above Luggard Road. Messrs. C. L. Tso and Li Yiu were put on the alert for ripe fruits which were subsequently collected in abundance and sown in the nurseries of the Botanical Institute and the Hongkong Botanical Garden.

If, as early as 1875, Hance in describing *Castanopsis Lamontii*** should regard it "strange that this fine tree which grows in a locality which must have been many times visited by former collectors, should have so long remained undetected," how much more true is the remark quoted when applied to a companion which openly defied detection for a further period of over half a century.

This new species is respectfully dedicated to the former Chancellor of Sun Yatsen University, Chow-Lu, L.L.D., Leipzig, under whose administration the Experimental Garden of the Botanical Institute became an

* **Lithocarpus Garrettiana** (Craib) Chun, comb. nov.
Quercus Garrettiana Craib in Kew Bull. 1911: 474. 1911.
Pasania Garrettiana (Craib) Hickel et A. Camus in Ann. Sci. Nat. Bot. Sér. 10, 3: 403. 1921.

** Jour. Bot. 13: 368. 1875.

important scientific adjunct of the University. The irreplaceable collection of living plants in the Experimental Garden has since been completely destroyed by Japanese vandalism.

Lithocarpus Howii, n. sp.

Arbor 6–12 metralis cortice fusco-cinereo; rami annotini defoliati patuli sparsi rigidi cinereo-corticati rugosi lenticellis elevatis foliorum delapsorum cicatricibusque magnis subrotundatis conspicue asperati; ramuli juniores cum petiolis dense molliter flavo-sericeo-tomentosi in anno secundo glabrescenti; gemmae late ovoideae, 4 mm. longae, obtusae perulis ovatis obtusis dense sericeo-tomentosis laxiuscule tectae. Folia per duos annos persistentia in apice ramulorum conferta longipetiolata subcoriacea obovato-oblonga, 9–12 cm. longa 2.5–5 cm. lata, apice subito acuta basi oblique cuneata, subconcoloria utrinque in sicco flavescentia, supra nitidula laete viridia, subtus opaca in costa elevata venisque breviter albido-strigillosa margine angustissime cartilaginea revoluta praeter basin dentato-crenata dentibus incurvis haud apiculatis, nervis primariis lateralibus utrinque 16–20 erga costam 6–8 mm. inter se distantibus sub angulo 50° egressis fere rectis supra leviter impressis subtus cum trabeculis transversis crebris prominenter elevatis, petiolis gracilibus superne late sulcatis puberulis, 3.5 4 cm. longis, stipulis lanceolatis acutis, 15 mm. longis 2 mm. latis, caducis, extus dense pilis longis adpressis flavido-sericeis. Flores feminei (emarcidi) in spicis subterminalibus pauciflori ad axem validam erectam puberulam verisimiliter tortuosam bini ternive glomerati sessiles, bracteis crassis turgidis dense tomentosis, stigmatibus divaricatis glabris. Fructus maturus stipitatus, stipite lenticellato 1.5–2.5 cm. longo 8 mm. crasso, durus permagnus turbinato-obpyriformis apice truncatus, basi attenuatus, circiter 5 cm. latus parte attenuato circ. 1 cm. longo incluso 5–6 cm. longus, pericarpio subcoriaceo superne circ. 2 mm. crasso a glande facile soluto pulchre sculpturato processibus e squamis mutatis rostriformibus validis turgidis recurvis conspicue armato; cupula totam glandem obvoluta squamis difformibus inferioribus in zonis indistincte annularibus confluentibus arcte adpressis reliquis finem fructu superpositis liberis confertis, ab infimis ad supremis longitudine variantibus inferioribus elongatis inter se distantibus lanceolatis elevato-marginatis mediis breviusculis sparsioribus intervallis planis separatis superioribus brevioribus liberis erectis confertis plerumque recurvis supremis multo minoribus tenuioribusque arcte incurvis cupulae orem occultis; glans depresse globosa ossea intus basi a dissepimentis induratis incompletis irregulariter 5-locularis sursum 1-locularis; semen fere totam glandem repletum basi alte lobatum, apice conico-umbonatum.

HAINAN: Kan-En District, Pai-Ling, tree 8–10 m. tall, 20 cm. diam., on summit of wooded hill, bark blackish gray, leaves lustrous deep green, Nov. 23, 1933, *H. Y. Liang 63717, 63725;* Ting-An District, Mao-Hsiang, tree 20 m. tall, Dec. 23, 1933, *C. Wang 36005, 36009;* Po-Ting District, Hsing-Lung, Tung-Tieh Ling, alt. 300 m., tree, leaves lustrous green beneath, fruits pale green, July 12, 1935, *F. C. How 73184* (TYPE); same locality, Hsuang-Chi-Na, alt. 800 m., tree 12 m. tall, in forests, bark gray, Sept. 4, 1935, *F. C. How 73630;* Wan-Ning District, Tung-Tieh Ling, tree 10 m. tall, in dense forest, with ♀ spike and detached ♂ fls., Nov. 26, 1936, *S. K. Lau 28249.*

This is one of the most distinct oaks so far discovered in this country. It agrees in all essential characters with the Sect. Synaedrys. There is no

evidence that the staminate spikes in a separate packet accompanying *Lau 28249* really belong to this species, and they are omitted in the description.

This new species is named after the collector, Assistant Professor F. C. How, who since joining this Institute as a young graduate has unwaveringly kept his voluntary pledge to dedicate his life to botany.

Lithocarpus iteaphylloides, n. sp.

Arbor 12–18 m. alta praeter inflorescentiam glaberrima cortice griseo-vel fusco-brunneo ramis ramulisque gracilibus nitentibus junioribus dense foliatis griseis angulatis vetustioribus nigris teretibus fere levibus. Folia biennia subcoriacea lanceolata vel elliptico-lanceolata 5–10 cm. longa 2–3 cm. lata, apice longe obtuseque acuminata basi attenuata et usque ad basin petioli angustissime decurrentia margine integra passim undulata supra viridia nitida subtus pallidiora, costa utrinque elevata nervis primariis lateralibus utrinsecus circ. 16–18 gracillimis infra tantum subtiliter elevatis venulis crebre reticulatis praesertim subtus leviter tantum prominentibus; petioli longitudine in eodem ramo satis variabili 5–15 mm. longi. Inflorescentia masculina in apicibus ramulorum et axillis foliorum summorum paniculata pedunculis communis angulatis incano-tomentosis, amentis 3–6 cm. longis folio brevioribus adscendenti-patentibus, rhachis tereti incano-tomentosa multiflora, floribus singulis sessilibus extus dense incano-tomentosis inferioribus dissitis superioribus congestis; bracteae lanceolatae perianthio paulo longiores; perianthii lobi 6 inaequales ovati acuti circ. 1 mm. longi; stamina 12 exserta 2.2 mm. longa, filamentis supra basin connectivi elliptici adnatis leviter complanatis obscure puberulis, antheris subrotundatis apice distincte apiculato-umbonatis; ovarii rudimentum dense incano-pilosum. Spicae fructiferae laterales in parte superiore ramulorum 5–7 cm. longae; fructus biennes in rhachidibus 5 mm. crassis lenticellatis nigris ternatim aggregati sessiles; cupula cupuliformis lignea 3–4 mm. alta 8 mm. lata basin tantum glandis amplectens intus sericeo-pilosula extus fulvo-tomentosula, squamis adpressis late rhomboideo-ovatis apiculatis circiter 4–5 serialibus; glans ovoidea sursum attenuata apice umbonata glabra graminea lucida circ. 10 mm. lata umbone incluso 12–13 mm. alta; cicatrix concava, circ. 4 mm. diametro.

KWANGTUNG: Hsin-I Hsien, Ho-Hsui, Mu-Lan Chai, tree 12 m. tall, in woods, bark brown, Aug. 16, 1931, *S. P. Ko 51800;* same locality, tree 8 m. tall, in mixed woods, bark gray, flowers yellowish white, April 9, 1932, *C. Wang 32062;* Yen-Fa Hsien, Tung-Lo-Ping, shrubby tree 4–5 m. tall, Dec. 12, 1927, *W. Y. Chun 6000.*

This species differs from *L. Hancei* (Benth.) Rehder in slender blackish not grayish branchlets, much thinner smaller leaves and smaller cup with less distinct scales arranged in fewer zones. From *L. iteaphylla* (Hance) Rehd., with which this new species seems to be more closely allied, it is at once distinguished by the ternately coalescent not solitary acorns. *Lithocarpus ternaticupula* Hayata, of which we have authentic specimens from Formosa, differs in having a thicker deeper cup with prominently swollen scales and larger acorns. These four species belong to a closely related group but seem to be specifically distinct.

Lithocarpus obovatilimba, n. sp.

Arbor parva ad 8 m. alta; ramuli teretes hornotini annotinique pube

dense flocculenti-tomentoso initio flavo mox sordide fusco persistente vestiti, vetustiores glabrescentes nigrescentes crebre rimosi. Folia biennia ad apicem ramulorum conferta brevipetiolata coriacea obovata, 3.5–5.5 cm. longa 2.5–3 cm. lata, apice rotundata vel obtusa vel acumine brevi lato obtuso plus minusve abrupte terminantia, basi cuneata asymmetrica margine satis revoluta in sicco supra intense brunnescentia nitida subtus pallidiora opaca, in vivo e collectore supra atro- subtus argenteo-viridia, utrinque pagina praeter basin costae parce sordide tomentosam glaberrima, nervis lateralibus utrinsecus 5–7 angulo valde obtuso divergentibus tenuibus sursum leviter curvatis intra marginem evanascentibus supra obscure impressis subtus leviter tantum distinctis venulis fere obsoletis; petiolus robustus, supra complanatus, infra semiteres basi dilatatus dense fulvo-tomentosus usque ad 8 mm. longus sed saepius brevior. Flores desunt. Spicae fructiferae in parte superiore ramulorum solitariae rhachidibus ramulis annotini aequicrassis et similiterque indutis circ. 2 cm. longis, fructibus paucis confertis sessilibus basi coalitis, cupulis alte patelliformis 4 mm. altis 12 mm. latis fragilibus intus sericeo-pilosulis extus incano-tomentosis, squamis pluri-serialibus imbricatis laxe adpressis e basi late triangularibus abrupte acuminatis acumine libero erecto calloso-apiculato subglabro brunnescente, inferioribus dorso convexis mediis et superioribus planiusculis supremis cupulam superantibus et eam marginem aliquanto fimbriatis, glande cupulam multo superante ovoidea lucida 12 mm. alta 10 mm. lata, cicatrice concava ± 5 mm. diam.

HAINAN: Ling-Hsui, Ka-She Tu, alt. about 800 m., small tree, in mixed woods, bark gray, leaves deep green above, silvery green beneath, Nov. 9, 1935, *F. C. How 73758*.

In general appearance this species resembles *Lithocarpus glabra* (Thunb.) Nakai but with the leaves much broader in proportion to their length and obovate in outline. In addition, in Nakai's species the scales are closely appressed to the cup and confluent with only their shortly mucronate apices evident.

Lithocarpus podocarpa, n. sp.

Arbor 20 metralis vel ultra praeter inflorescentiam glaberrima ramulis griseis parce lenticellatis obscure rimosi. Folia persistentia tenuiter coriacea oblonga vel elliptico-oblonga 8–10 cm. longa 3–4 cm. lata apice breviter abrupteque obtuso-acuminata basi cuneata discoloria utrinque nitida in sicco supra brunnescentia subtus argentata margine revoluta passim undulata costa utrinque elevata nervis lateralibus in utroque latere 8–10 tenuibus supra impressis subtus elevatis adscendentibus sursum arcuatis versus marginem anastomosantibus trabeculis subparallelis prominulis connexis petiolis sulcatis circ. 1 cm. longis suffultis. Amenta utriusque sexus in parte superiore ramulorum et axillis foliorum summorum erecta, masculina saepius paniculatim aggregata, femina ex axillis bractearum in ramulis aphyllis simplicia pauca. Amenta ♂ 10–15 cm. longa densiflora parce pulverulento-puberula floribus secus axin singulis interruptis vel approximatis, bractea externa triangulari-subulata perianthio breviore bracteisque lateralibus ovato-acutis stipitatis; perianthium cupulatum circ. 1 mm. altum extus furfuraceo-puberulum intus glabrum margine breviter 6 lobatum lobis herbaceis deltoideis obtusis vel

acutiusculis; stamina 12 exserta circ. 3 mm. longa filamentis glabris antheris cordato-ovatis apice apiculatis basi discretis; rudimentum ovarii depresse globosum obscure angulatum pilosum. Spica ♀ 7–14 cm. longa pauciflora infra medium nuda rhachi floribusque furfuraceo-puberulis; flores singuli dissiti stipitati stipite pulviniformi flore subaequilongo, bractea externa subulata minuta; perianthium cupulatum ovario arcte cinctum extus sulcatum margine breviter dentatum dentibus ovatis obtusis; styli 3 divergentes recti obtusi basi pilosi. Fructus biennes secus pedunculum inferne nudum in parte superiore 7–9 aggregati manifeste pedicellati; cupula late pateriformis 14 mm. diametro basi in pedicellum validum 3–5 mm. longum abrupte contracta tenuiter lignosa basi glandem tantum amplectens, intus puberula extus tomentosula squamis 6–7-serialibus apice apiculato excepto omnino confluentibus; glans hemisphaerica aut depresse globosa, 14–15 mm. lata altaque, basi truncata apice umbone conico tomentoso coronata, atrocastanea glabra; cicatrix concava albida 8 mm. diametro.

KWANGTUNG: Yun-Fou Hsien, Cha-Tung, tree "40 m." tall, bark gray-black smooth not fissured, Feb. 1, 1928, *C. C. Wang 553;* same district, Yun-Wu Shan, tree 20 m. tall, flowers white, cup gray, acorn green, Oct. 20, 1934, *C. Wang 37559*, (Bottle No. *C/529*), (TYPE); Fang-Chang, tree 5 m. tall, in ravine, Nov. 21, 1930, *H. D. Wong 39;* Hsin-I Hsien, Ho-Hsui, tree 15 m. tall, in village wood, bark gray, flowers white, Nov. 22, 1934, *C. Wang 37954.* HAINAN: Ling-Hsui, Tung-Chia, Ta-Lan Shan, tree 18 m. tall, in wooded ravine, bark grayish white, acorn green with whitish umbo, cup grayish white, Sept. 24, 1932, *N. K. Chun & C. L. Tso 43916;* Ting-An Hsien, Mao-Hsiang Ling, tree 20 m., in mixed woods, bark gray, Dec. 27, 1933, *C. Wang 35858* (Bottle No. *B/368*); same locality, tree 8–10 m. tall, flowers creamy white, Jan. 9–11, 1934, *H. Y. Liang 64292, 64471, 64472;* Pao-Ting Hsien, Hsing-Lung, tree 11 m. tall, in mixed forests, bark gray, leaves silvery gray-green beneath, acorns lustrous green, Aug. 5, 1935, *F. C. How 73380;* without data, coll. *H. Fenzel s.n.* (B. I. *Herb. No. 17758, 18373*).

This species is at once distinguished from its nearest allies *L. vestita* (Hick. et A. Camus) Chun* and *Lithocarpus Paviei* (Hick. et A. Camus) Chun by its glabrous wholly exserted acorns. The other Indo-Chinese species with pedicellate cups differ from our Chinese species either in connate fruits or cupular structure or markings.

The fruits in some of the Hainan specimens show some variation, ranging from generally hemispheric to depressed globose in form, otherwise all the collections are very uniform.

Lithocarpus tremula, n. sp.

Arbor parva 5–8 metralis praeter ramulos juveniles inflorescentiasque glabra; ramuli hornotini initio parce fulvo-tomentosi cito glabrati anno secundo tertioque subteretes atro-grisei crebre rimosi. Gemmae ovoideo-conicae acutae castaneae squamis ovatis obtusis extus praeter marginem adpresse sericeo-pilosis. Folia triennia longipetiolata coriacea elliptica vel elliptico-lanceolata vulgo 6–9 cm. longa 2–3.5 cm. lata, apice caudato-acuminata acumine falcato obtuso, basi cuneata vel acuta in petiolum breviter extensa, margine integra plana, supra olivacea nitida in sicco flavescentia, subtus pallidiora opaca, costa utrinque elevata vix conspicua,

* **Lithocarpus vestita** (Hickel et A. Camus) Chun, comb. nov.
Pasania vestita Hickel et A. Camus in Ann. Sci. Nat. Bot. Sér. 10, 3: 393. 1921.

nervis lateralibus primariis utrinsecus 7 8 sub angulo 50° divergentibus sursum curvatis tenuibus intra marginem obscure confluentibus, subtus tenuiter elevatis prominulis, venulis fere nullis; petioli infra medium semiteretes sursum manifeste compressi longitudine satis inaequilongi ei foliorum summorum vix ultra 1 cm. longi inferiorum usque ad 3 cm. longi. Flores ♂ non vidi. Spica ♀ ad apicem ramuli 2–3 aggregata erecta simplicia 8–10 cm. longa, floribus cum rhachi validi angulati leviter tortuosi fulvo-tomentosis paucis ternatim interdum quinatim fasciculatis fasciculis dissitis bractea externa ovato-acuminata flore longiore bracteisque 2 lateralibus ovato-rotundatis brevioribus omnibus extus et basi intus pilosis suffultis, perigonio ovario multo breviore breviter 5–6-lobato, stylis 3 brevibus rectis divaricatis obtusis glabris. Spicae fructiferae 16–26 cm. longae moderanter robustae fructibus sessilibus seggregatis juvenilibus saepissime ternatim confluentibus sed unico in eodem fasciculos tantum maturante; cupula hemisphaeroidea lignosa solida basi truncata in parte superiore plano-patelliformis usque ad 12 mm. lata margine leviter curvata vel fere plana, intus purpurascens glabra umbilico centrale valde elevato 6 mm. diametro, extus fulvo-tomentosula concentrice annulata annulis 7–9 passim denticulatis inferioribus distantibus dorso convexis superioribus marginem versus proprioribus planiusculis indistinctis; glandes non satis maturae discoideo-hemisphaericae umbonatae fere omnino exsertae 5 mm. altae 10 mm. latae pallide castaneae nitidae, cicatrice concava 5 mm. lata.

HONGKONG: New Territories, Wu-Kau Tien, roadside, tree 5 m. tall, leaves lustrous, pale green beneath fruiting cups reddish brown, Jan. 18, 1930, *N. K. Chun 40213* (TYPE). KWANGTUNG: Lo-Fou Shan, tree 6 m. tall, in mixed woods, pistillate spikes whitish hairy, July 26, 1930, *N. K. Chun 41383;* same locality, tree 8 m. tall, on bank of stream, Aug. 18, 1930, *N. K. Chun 41619;* Hsin-I, Ho-Hsui, Mu-Lan Chai, tree 8 m. tall, in mixed woods, bark gray, leaves light green beneath, cup gray, Aug. 16, 1931, *C. Wang 31170.*

My nephew, the discoverer of this new species, was attracted to the tree from a great distance by the scintillating foliage when the sun shone on its crown. The rustling tendency of the leaves is due to the partially flattened petioles.

Quercus conduplicans, n. sp.

Arbor 22 m. alta ramulis subangulatis ramisque teretibus gracilibus fusco-nigris initio parce sordideque tomentellis cito glabratis. Folia biennia in apicem ramulorum confertà coriacea longe graciliterque petiolata coriacea discoloria lanceolata, absque petiolo 9–14 cm. longa 2–2.5 cm. lata, apice sensim caudato-acuminata acumine 1–1.5 cm. longo falcato acutiusculo obtusove, deorsum longe attenuata simul inaequilateraliter cuneata, margine cartilaginea subtiliter revoluta supra medium crenato-dentata dentibus utroque latere 6–7 calloso-mucronatis, utrinque glaberrima in sicco brunnescentia, supra subnitida costa impressa vel leviter sulcata nervis primariis tenuissimis cum trabeculis transversis crebris pariter prominulis inter se eximie connexis, nervis primariis lateralibus utrinque 9–11 adscendentibus distantibus fere rectis atque costa elevata subtus satis eminentibus prope marginem dissolutis et haud in dentem excurrentibus venulis ultimis tantum leviter perspicuis; petiolus supra leviter planus sulcatusque, basi dilatatus, minute puberulus, usque ad 2.5 cm. longus interdum brevior. Flores desunt. Fructus ut videtur

biennis solitarius sessilis in ramulo pedunculiformi valido tereti folio breviore subterminalis; cupula e basi hemisphaerica lignosa in limbum circularem latum crassum coriaceum subito ampliata ubique (intus basi excepta) densissime brunneo-lanuginoso-velutina extus concentrice zonata annulis circiter 5–7 crassis integerrimis supremo a margine remoto; cupula propria cupuliformis ore expanso 10–12 mm. lato, intus 6 mm. alta quartem partem glandis amplectens; limbus explanatus 3–3.5 cm. latus sursum deorsum undulatus margine passim conduplicatus plicis saepius 6 extrorsim adsurgentibus intervallis plus minusve intrusis decurvis vel valde revolutis separatis; glans cylindrica apice umbonata umbone conico incluso 2.5–3.2 cm. longa, medio 1.2–1.6 cm. lata, atrocastanea apice basique saepius plus minusve adpresse fulvo-sericeo-pilosa; cicatrix plana circ. 5 mm. diam.

Species inter Asiaticas cupularum configuratione diversissima.

KWANGTUNG: Yao-Ping Hsien, Phoenix Mt., tree 22 m. tall, leaves dark green above, pale green beneath, acorn dark brown, cup with brownish velvety tomentum, April 21, 1931, *N. K. Chun 42741* (Bottle No. *DD/7*).

This remarkable species is unlike any other known to us in the peculiar structure of the cupule. The cupule is composed of two parts different from each other in texture, a cup proper, hemispheric and woody, and an abruptly expanded broad circular limb which, in the living state must presumably be fleshy, eventually becomes thickly coriaceous and strongly undulate with conduplicate upwardly curving folds alternating with decidedly indented and more or less revolute intervals.

Quercus gracilenta, n. sp.

Arbor 15 m. alta trunco 40 m. diametro; trunci cortex crassus extus atro-brunneus subtus purpurascens, levis numquam fissus tantum reticulato-striatus; ramuli novelli gracillimi distincte angulati sulcatique initio fulvo-floccoso-tomentosi cito glabrescentes annotini subteretes fusco-nigri lenticellis parvis obscure dispersi. Folia per duos annos persistentia longipetiolata tenuiter coriacea adulta glabra lanceolata elliptico-lanceolata vel -oblanceolata 6–9 cm. longa 1.5–3 cm. lata, apice acute breviter acuminata acumine tenui interdum curvato circ. 6 mm. longo, deorsum longe attenuata basi oblique cuneata margine cartilaginea anguste revoluta supra medium crenato-denticulata dentibus gracilibus calloso-apiculatis, supra atro-viridia nitidissima in sicco laete luteo-viridia subtus opaca siccitate flavescentia, nervis lateralibus tenuibus utrinque 12–16 sub angulo 55° a costa divergentibus fere rectis sed apicem versus leviter curvatis supra planis subtus elevatis reticulo venularum utrinque prominulo, petiolis gracilibus basim versus fulvo-floccoso-tomentosis 1.5–2 cm. longis. Flores ♂ non visi. Spica feminea axillaris erecta 12 mm. longa ramulis aequicrassa, ubique fulvo-floccoso-tomentosa floribus 3–4 sessilibus singulis versus apicem pedunculi teretis approximatis, stylis 4 brevibus divaricatis apice peltatis bilobulatis. Fructus biennis solitarius sessilis; cupula campanulata crassa 2.8 cm. longa 2.4 cm. diam., extus intusque dense fulvo-velutino-tomentosa concentrice zonata annulis 9–11 subaequidistantibus arcte adpressis integris marginem leviter incrassatis; glans pro maxima parte inclusa obturbinato-cylindrica medio umbonata 3 cm. longa 1.5 cm. lata initio tenuiter fulvo-tomentosa mox glabrescentia; cicatrix plana 6–7 mm. diam.

KWANGTUNG: Kiangsi border, Lung-Chuen, San-Chi Kou, tree 15 m. tall, on roadside, leaves lustrous deep green above, dull pale green beneath, pistillate flowers and fruits brown tomentose, April 29, 1930, *C. L. Tso 21629*.

This new species differs from *Quercus pachyloma* Seem. in the thin elliptic leaves with the upper part of the margin sharply crenate-dentate from or below the middle, in the more numerous close lateral veins very distinct on the upper surface, as well as in the larger acorns. In *Q. pachyloma* the leaves are thicker, not distinctly veined on the upper surface with fewer veins ending in callose not apiculate teeth.

Quercus nemoralis, n. sp.

Arbor 15 metralis partibus juvenilibus pilis fasciculatis densis brevibus arcte adpressis initio flavescentibus deinde incanis diu persistentibus tectis, ramulis gracilibus obtuse pentagonis 5-sulcatis anno secundo tertioque valde incrassatis atro-corticatis lenticellis minutis conspersis tarde glabrescentibus. Folia biennia crasse coriacea rigida longipetiolata oblonga raro oblanceolato-oblonga sursum in acumen falcatum obtusiusculum subito attenuata basi oblique producta, 10–16 cm. longa 3.5–5 cm. lata, margine infra medium usque ad apicem remote crenato-dentata dentibus callosomucronatis, supra laete viridia in sicco pallide flavo-viridia adulta glabrata costa plana pulverulento-tomentosa, subtus glauca siccitate albescentia vel canescentia praecipue secus costam elevatam nervosque fasciculato-pilosa, nervis lateralibus eminentibus utroque latere 9–13 adscendentibus fere rectis tantum paululum curvatis ad serraturas excurrentibus; petioli graciles teretes 2–4 cm. longi, basi dilatati. Flores ♂ desunt. Spicae ♀ (post anthesin) in axillis foliorum superiorum solitariae ut videtur 1-florae vix ultra 1 cm. longae fructibus nascentibus sessilibus; bracteae fugaceae; ovarium ovoideum tenuiter tomentosum perianthio 2-annulato dense tomentoso integro pro maxima parte circumdatum; styli 5 divaricati subulati sursum glabrati apice peltato-expansi. Fructus verisimiliter semper solitarius pedunculo ramo anni crassiore petiolis breviore suffultus; cupula hemisphaerica, basi truncata, circiter 2.5 cm. lata, intus adpresse fulvo-sericeo-pilosa extus flavescenti-tomentosa concentrice zonata zonis 9–11 inferioribus crassis distantibus grosse eroso-dentatis vel -denticulatis superioribus minimis propioribus integerrimis supremis incurvis; glans semi-exserta cylindrica rubro-brunnea umbo conico 5 mm. longo incluso 4–5 cm. longa 2.5 cm. diam., adpresse fulvo-pilosa pilis derasis evanescentibus, cicatrice convexa pallida 1.2 cm. lata.

HAINAN: Ting-An Hsien, Lung-Wan, tree 15 m. tall, with gray bark, in mixed woods, Jan. 23, 1934, *C. Wang 36843* (TYPE); Po-Ting Hsien, Hsing-Lung, Hsuang-Chi-Na, alt. about 800 m., tree 14 m. tall, with brown bark, Aug. 27, 1935, *F. C. How 73518*.

This species is perhaps closest to *Q. zanthoclada* Hick. et A. Camus from Indo-China from which it is easily distinguished by the dense yellowish to grayish indumentum on the branchlets petioles and lower surface of the leaves, and by the hemispheric cup with many more concentric zones which are erose, at least the lower ones.

Quercus patelliformis, n. sp.

Arbor 12 m. alta ramulis fuscis striatis anno secundo griseo-nigris lenticellis parvis conspersis. Gemmae obovoideo-oblongae obtusae 5 mm.

longae perulis inferioribus late triangulari-ovatis superioribus oblongis obtusis glabris castaneis marginibus purpurascentibus minute ciliolatis. Folia biennia firme coriacea longipetiolata elliptico-oblonga 5–12 cm. longa 2.5–6 cm. lata, apice in acumen gracilem caudatum falcatum 1.5 usque ad 3 cm. longum gradatim contracta, basi rotundata obtusave interdum late acuta, margine parce incrassata revoluta supra basin crenato-dentata dentibus remotis mucrone calloso lato obtuso incurvo terminantibus, supra obscure viridia glabra costa plana, subtus pallidiora in sicco brunnescentia costa elevata nervis utrinsecus 9–11 sub angulo 45° divergentibus leviter curvatis elevatis trabeculis transversis utrinque leviter tantum distinctis venulis ultimis dense reticulatis subfoveolatis; petiolus tenuis semiteres supra planus 2–4 cm. longus. Flores masculinus ignotus. Spicae femineae e medio rami anni axillares 2–2.5 cm. longae erectae, rhachis tenuis angulata glabra pauciflora floribus singulis alternis sessilibus, praeter involucri hemisphaerici apicem tenuiter pilosum glabrescentibus, perianthio breviter 6-dentato dentibus triangularibus acutis, stylis alte connatis erectis apice trilobatis lobis capitato-dilatis incurvis. Fructus biennis singulus sessilis pedunculo valido lenticellato vix ultra 1 cm. longo suffultus; cupula patelliformis 2 cm. lata 4 mm. alta exigue marginata, intus adpresse sericea umbilico lato convexo prominente notata, extus adpresse tenuiterque flavido-tomentosa annulatim zonata zonis 8–9 inferioribus 5–6 erosis superioribus integris vix manifeste propioribus; glans depresse hemisphaerica apice subrotundata vel planiuscula medio umbonata umbone conico incluso 2–2.2 cm. alta 2.5–2.8 cm. lata, dense fulvido-stellato-tomentosa; cicatrix convexa ± 2 cm. lata.

HAINAN: Yai Hsien, tree 15 m. tall, Oct. 1, 1933, *C. Wang 34414;* Kuei-Kai Shan, Nan-Lin, tree 12 m. tall, in mixed woods, Oct. 16, 1933, *C. Wang 34658* (TYPE); Kan En Hsien, Shan-Man Tou, tree 12 m. tall, bark blackish gray, fruit brown, Sept. 3, 1933, *H. Y. Liang 63355;* Chuang-Kou Ling, tree 12 m. tall, brown tomentose, Oct. 8, 1933, *H. Y. Liang 63421;* Ling-Hsui Hsien, Seven Finger Mts., Jan. 14, 1934, *C. Wang 36696.*

This species is characterized by highly connate columnar styles, and a somewhat depressed hemispheric acorn borne on a shallow cup with a narrow rim. It may be compared with the Indo-Chinese *Q. chrysocalyx*, *Q. asymmetrica* and *Q. Dussaudii* Hick. et A. Camus., differing from the former two in the coriaceous leaves and the non turbinate acorns, from the last-named in the dentate leaves and the smaller shallower cup, and from all three in the stylar structure.

Quercus phanera, n. sp.

Arbor ultra 10 m. alta (fide Liang) fere undique glabra cortice rami ramulique nigrescenti ramulis tenuibus angulatis foliosis in anno secundo moderanter incrassatis verruculosis. Gemmae ovoideo-oblongae obtusae angulatae castaneae nitidae 6 mm. longae 3 mm. latae, perulis pluris imbricatis ovatis obtusis dorso parce pilosis margine ciliatis alibi glabris. Folia perennia rigide coriacea oblanceolato-elliptica 3.5–7 cm. longa 1.5–3 cm. lata apice abrupte breviterque acuta basi cuneata plus minusve in petiolum anguste decurrentia, supra atroviridia nitidissima subtus pallidiora, margine cartilaginea valde revoluta e medio vel versus apicem irregulariter crenato-denticulata denticulis haud apiculatis interdum ad crenulas indistinctas reductis, costa supra plana subtus elevata, nervis

lateralibus primariis utrinsecus plerumque 9 adscendentibus curvatis infra marginem evanescentibus subtus valde elevatis cum venulis subparallelis subtransversis numerosissimis eminentibus insigniter connexis, petiolis vix ultra 1 cm. longis. Flores ignoti. Pedunculus fructiferus circ. 1 cm. longus teres validus lenticellatus in axillis foliorum prope apicem ramuli annotini solitarius; fructus biennis subterminalis singulus sessilis; cupula conico-hemisphaerica tenuiter lignosa 1.8 cm. alta 2 cm. lata quartem partem glandis amplectens ore leviter constricto, intus adpresse fulvo-sericeo-pilosa extus tenuiter flavescenti-tomentosula concentrice zonata zonis 11–12 levibus tenuibus inferioribus 6 latis fere aequidistantibus grosse erosis intermediis 2 angustioribus propioribus erosulis, reliquiis proximis integris; glans cylindrica vertice truncata crasse umbonata basi leviter attenuata tota pilosa pilis adpressis fulvo-sericeis diu persistentibus, usque ad 4 cm. longa 2 cm. lata umbone conico 4 mm. alto concentrice 7–9 annulato; cicatrix convexa alte extrusa circ. 10 mm. diametro.

HAINAN: Heng-Po-Po, vicinity of Loy village, tree over 10 m. tall, in dense woods along trail, bark gray-black, leaves deep lustrous green, acorn hairy, Feb. 21, 1934, *H. Y. Liang 65095*.

A species in the alliance of *Q. Edithae* Skan and *Q. cambodiensis* Hick. et A. Camus, differing from both in the glabrous vegetative parts, the strongly reticulate leaves, the more numerous annular rings on the cup, and the much larger cylindric acorns.

Quercus Sinii, n. sp.

Arbores vel frutices fructibus juvenilibus exceptis fere undique glabri. Ramuli juniores graciles angulati cani lenticellis paucis parvis ellipticis conspersi, vetustiores subteretes atro-cinerei verruculosi. Folia ut videtur per hiemen haud persistentia tenuiter coriacea longipetiolata siccitate atro-brunnea fere concoloria in eodem ramulo satis variabilia, hunc e basi rotundato-ovata vel ovato-oblonga, nunc basi obtusa cuneatave ovato-lanceolata, minora 5–6 cm. longa 1.8–2 cm. lata, majora usque ad 10 cm. longa et 4 cm. lata, apice sensim acuteque acuminata acumine magis quam vulgo lato plus minusve 1.5 cm. longo falcato raro fere recto, basi plerumque inaequilateralia plerumque rotunda rarius obtusa vel breviter acuta in petiolum abrupte breviterque contracta, margine subcartilaginea anguste revoluta supra basin dentato-serrulata serraturis sparsis antrorsum adsurgentibus e basi lata sursum attenuatis apice crasse mucronatis vel spinulosis mucronis spinulisve usque ad 5 mm. longis incurvis interdum porrecto-adscendentibus, supra glabra subtus erga costam mediam praesertim in axillis nervorum stellato-tomentosa, costa tenuis supra plana subtus elevata nervis lateralibus primariis 10–12 adscendentibus sursum leviter curvatis et in dentem excurrentibus cum secundariis subtransversis crebris tertiariisque dense reticulatis eximie conjunctis supra subtusque pariter distinctis; petiolus 8–20 mm. longus gracilis semiteres, supra sulcatus, sordide fasciculato-tomentosus pube facile detersibili. Flores desunt. Fructus annuus (in specimine unicus tantum satis maturus) foliorum superiorum axillis singuli vel bini breviter spicati, pedunculo 8–12 mm. longo ramis anni crassiore tereti glabro crebre rimoso; cupula sessilis tenuis alte cupuliformis 14 mm. lata 8 mm. alta fere totam glandem amplectans, basi attenuata ore leviter constricta, intus argenteo-pilosa, extus fulvo-incano-tomentosa imbricatim squamosa squamis 7–9-serialibus

arcte adpressis parvis dorso plus minusve tumidis imis oblongo-ovatis obtusiusculis aliis ovatis obtusis; glans graminea late ovoideo-conica apice graciliter umbonata praeter apicem stylopodii pilosum glabra, circ. 9 mm. lata, absque umbone 8 mm. alta; cicatrix convexa circ. 4 mm. lata.

KWANGTUNG: Yunfou, alt. 130 m., on rocky hill, small tree about 6 m. high, bark gray, Sept. 21, 1928, *S. S. Sin 5240*.

The nearest ally seems to be *Q. setulosa* Hick. et A. Camus, an inadequately described Annamese plant known only in very young fruit, from which the Chinese tree differs in longer petiolate generally ovate leaves, dentate from near the base and terminated by an unusually broad acumen. The fruits, though not exactly comparable in stage of growth, in our species have less distinct but more tumid cup-scales and are borne on a much shorter and stouter peduncle.

This new species is named after Professor S. S. Sin, former Head of the Biology Department of Sun Yatsen University, under whose able and energetic direction several expeditions despatched to little known regions in Kwangsi and Hunan procured much new phytogeographic data of great scientific interest and value. The collections, as yet only partially studied, are proving to be unusually rich in undescribed species.

BOTANICAL INSTITUTE,
SUN YATSEN UNIVERSITY,
CANTON, CHINA.

A NEW LACTIFEROUS PLANT IN SOUTH CHINA

WOON-YOUNG CHUN

AND

YING TSIANG

Parabarium Huaitingii Chun et Tsiang, sp. nov.

Frutex ramosus scandens usque ad 13 m. altus (e collectore), praeter lobos corollae cinereo- vel rufo-tomentellus, ramis ramulisque teretibus robustis irregulariter et longitudinaliter striolatis 2–3 mm. crassis lenticellatis, internodiis 2–5 cm. longis. Glandulae inter- et intrapetiolares complures caducissimae nigrescentes subulato-lineares 1 mm. longae. Folia ad apicem ramulorum disposita tenuiter chartacea vel adulta crassiuscula utrinque molliter pubescentia, subtus pilis ad nervos densioribus, ovato- vel oblongo-elliptica margine leviter revoluta apice acuta vel breviter acuminata basi anguste rotundata raro late cuneata superne intense viridia subtus pallidiora 2.5–7.5 cm. longa et 1.5–3.5 cm. lata, in speciminibus fructiferis maxima 11 × 4.5 cm., costa nervisque superne planiusculis et subtus conspicue elevatis, lateralibus utrinsecus usque ad 10 arcuato-adscendentibus ante marginem anastomosantibus, petiolo tomentoso usque ad 5 mm. longo. Pleiochasia subterminalia vel raro axillaria congesta corymbiformia confertiflora 4–6 cm. alta, bracteis foliaceis 1–3 cm. longis et 0.5 1 cm. latis, pedicellis filiformibus, 1–2 mm. longis. Gemmae obtusae. Flores fragrantes (e collectore). Calyx subcampanulatus extus tomentellus quincuncialiter partitus, segmentis oblongo-lanceolatis obtusis 2 mm. longis et 1 mm. latis, squamulis intracalycularibus 5 minutis; corolla flavescens urceolato-rotata extus puberula intus basi dense pubescens excepta glabra, tubo 2 mm. alto, fauce nuda et ampliata basi constricta, lobis dextrorsum obtegentibus et sinistrorsum contortis in aestivatione apicibus ovatis obtusis abrupte inflexis, post anthesin patentibus et valvatis 2 mm. longis et basi 1 mm. latis; stamina prope basim tubi inserta filamentis perbrevibus antheris lanceolato-sagittatis; discus tenuiter 5-lobatus; carpella ovarii 2, pilosa utrumque circiter 10-ovulatas; stylus perbrevis; caput stigmatis turbiniforme apice obscure bifidum. Folliculi gemini vel abortu singuli ovato-lanceolati basi dilatati et apicem versus attenuati 6–7 cm. longi et basi 1.5–2 mm. diametro, epicarpio basi rugoso et supra medium striolato; semina lineari-oblonga atrofulva pubescentia basi acuta et apice fere truncata 10–15 mm. longa et 2–3 mm. lata, comis albo-sericeis verticillatis circiter 3 cm. longis; embryo longiusculo, cotyledonibus radicula subaequalibus; cotyledones albae oblanceolatae utrinque obtusiusculae 7 mm. longae et 2 mm. latae; radicula cylindrica ultra 6 mm. longa.

KWANGSI: Shih-Wan-Ta Shan, Hsiang-Tze, scandent shrub 6 m. in ravine, Feb. 7, 1944, *S. H. Chun 4514;* same locality, scandent shrub 13 m., flowers light yellow, fragrant, April 30, 1944, *S. H. Chun 5027* (TYPE in Bot. Inst., Sun Yatsen Univ.); Nan-Ning, roadside, scandent shrub 6 m., June 17, 1944, *S. H. Chun 5305;* Yung

Hsien, Ta-Tseh-Tsuen, vine climbing on trees, fruit greenish, Aug. 12, 1933, *A. N. Steward & H. C. Cheo 800;* same locality, on open slope, scandent shrub 4 m., Nov. 18, 1938, *H. C. Hoh 82524;* without data, *Univ. Kwangsi 83952, 92952.* KWANGTUNG: Yang-Shan, along stream, fruit green, July 30, 1936, *L. Tang 225;* Lun Hsien, in ravine, Oct. 1, 1945, *S. H. Chun 5547.*

The genus *Parabarium* Pierre is characterized by compact, corymbose cymes with the apices of the corolla-lobes abruptly inflexed in aestivation, and by follicles which are prominently dilated at the base and somewhat abruptly attenuated upwards into a long, slender beak. In indumentum, *P. Huaitingii* approaches *P. velutinum* Pitard, but the Indo-Chinese species, in addition to other morphological characters, is at once distinguished by much larger leaves of a different form, larger inflorescence and fruits. On account of the densely flowered inflorescence and the form of the fruit, our plant seems to be more closely allied to *P. micranthum* (Wall.) Pierre, but that species, like all other species hitherto ascribed to the Chinese flora and enumerated by the junior author in 1934,* are totally glabrous.

In the spring of 1944, the governments of Kwangtung and Kwangsi jointly dispatched a botanical party into the interior of the Shi-Wan-Ta Shan, Kwangtung-Kwangsi border, in search of gummiferous plants furnishing possible substitutes for rubber. The survey and identification of the plants collected were entrusted to this institute. Our collector, S. H. Chun, succeeded in gathering over thirty species belonging to various families and orders, all producing more or less abundant latex, those of the Apocynales including *Chonemorpha macrophylla* (Roxb.) G. Don, *Parabarium micranthum* (Wall.) Pierre, and the newly proposed species described above being the most promising. The latex was first coagulated by acetic acid in the field, and upon refining by government laboratories, has been found, at least in some cases, to be serviceable in the electrical and automobile industries.

This new species, which undoubtedly will become economically important, is named after and dedicated to Professor Tang Tsic Yee, Dean of the College of Agriculture, Sun Yatsen University, to whose support our Institute owes much of its progress, and through whose life-long devotion to his chosen field, scientific agriculture in South China is beginning to benefit the daily life of the people.

BOTANICAL INSTITUTE,
SUN YATSEN UNIVERSITY,
CANTON, CHINA.

* Sunyatsenia 2: 117–125. pl. 24–25, f. 7. 1934.

NOTES ON THE DATES OF ISSUE OF DESVAUX'S JOURNAL DE BOTANIQUE

E. D. Merrill

Volume one of this short-lived periodical is dated 1808, it being made up of six numbers, 64 pages each, for the months of October, November, and December, 1808 (pp. 1–192), and January, February, and March, 1809 (pp. 193–384). Volume two is dated 1809, and its six parts, also of 64 pages each, are indicated as April, May, June, July, August, and September, 1809; these dates appear on the fascicle covers of the set in the Arnold Arboretum library. It is evident from certain corroborative data recently located that Desvaux was able to conform to his announced plan of publication, fascicle covers p. 4: "Ce Journal paroît dans le première huitaine de chaque mois, à compter du mois d'octobre 1808."

An "Avis aux souscripteurs" pasted on the fascicle cover of volume two, no. 6, and repeated on page 4 of the fascicle cover of this number reads in part: "Des mutations arrivées dans la Maison de commerce qui s'étoit chargée d'abord de faire paroître le Journal de Botanique, obligent les auteurs de suspendre cet ouvrage, jusqu'au mois janvier prochain . . . ." Desvaux's plan was then to issue a new periodical commencing in 1810 under the title Annales de Botanique; this plan was never consummated, but beginning in 1813 he did issue several volumes of another run of the Journal de Botanique, the remainder of the title considerably modified. The full title of the first two volumes (1808–1809) was: Journal de Botanique, rédigée par une société de botanistes; that of the second run (1813–1816) was: Journal de Botanique, appliquée a l'agriculture, a la pharmacie, a la médicine, et aux arts. It is not surprising that some botanical authors have confused these two runs of what were different periodicals under the same leading name, one in 1808–09, the other 1813–16.

The correctness of the indicated dates of issue of various parts of these two periodicals have been questioned, but certain contemporaneous reviews have recently been located which clearly prove that the years and months indicated for the first two volumes of the first Journal de Botanique are correct in spite of a statement by Desvaux (see below) that would seem to indicate that a later date (1810), was involved. From these reviews it is clear that there was at least some distribution of all of the individual numbers within the month indicated for each number, or in some cases actually in the preceding month.

The first statement that I noticed in reference to this periodical was by Rafinesque, Atl. Jour. 1: 207. 1833, where he indicated the date of certain

reprints of his papers as 1809; it is barely possible that one of these came out in 1808, however. Later I noticed Fernald's statement, Rhodora 34: 26. 1932, which is:

"The title page of Desvaux's Journal de Botanique, tome 1, is dated 1808, but Rafinesque himself stated in Atlantic Journal, i. 207 ("Winter of 1833") in his Cronological Index of his own botanical writings, that the paper was 'reprinted in Desvaux' Journal of Botany, Paris, 1809.' Desvaux complicated the question by himself stating in a volume dated 1814 that 'Nous avons publie en 1810, deux Volumes de 384 pages chacun et de 12 gravures' (see Fernald, Rhodora, xxix, 227 (1927). Since Vol. 1 (dated 1808) is the only one of the two volumes with 384 pages and 12 plates (Vol. 2 having 384 and 13 plates), we have Desvaux's word that it did not come out until 1810."

One suspects that Desvaux perhaps meant to say that by 1810 he had published two volumes, or perhaps there was not much distribution of the various issues before that date. Suspecting that the Journal général de la Litterature de France might throw some light on the actual dates of publication of Desvaux's periodical, and also on other botanical works issued in France between the years 1798 and 1841, a somewhat systematic examination of that serial was initiated. The data noted in reference to the two volume set of the Desvaux Journal de Botanique are summarized in the next paragraph.

Volume 1, no. 1, pp. 1–64 October, 1808 was reviewed Jour. Gén. Litt. France 11: 258 [September] 1808*; no. 2, pp. 65–128, apparently not recorded, but the fascicle cover date is November, 1808; no. 3, pp. 129–192, December, 1808, is reviewed in the November-December number of the Jour. Gén. Litt. France **11**: 323. 1808. The next three numbers were apparently not recorded, but the fascicle cover dates are: no. 4, pp. 193–256, January, 1809, but the date at the bottom of the cover is 1808, so this part may actually have been printed in 1808; no. 5, pp. 257–320, February, 1809; no. 6, pp. 321–384, March, 1809.

Volume 2, no. 1, pp. 1–64, April, 1809, is reviewed op. cit. **12**: 100. 1809, this being in the April issue; nos. 2 and 3, pp. 65–192, May and June, are reviewed op. cit. **12**: 130, May, 1809; no. 4, pp. 193–256, July, is reviewed op. cit. **12**: 194, the July number; and no. 5, pp. 257–320, August, is reviewed op. cit. **12**: 227, August, 1809. No entry was noticed for No. 6, this including pp. 321–384; its fascicle cover date is September, 1809.

The evidence here is that the editors of the Journal général de la Litterature de France actually received copies of the various issues of

* The parts do not actually bear the month of issue, but rather "premier cahier," "second cahier," etc. The serial was planned for twelve numbers annually, the *premier cahier* of each volume to be issued in January of each year. On the fascicle covers, however, many of which I have seen in unbound copies of volumes 23 (1820) to 27 (1824) the volume and part numbers, month, and year appear thus: "Vingt-troisième année Janvier 1820 — Premier Cahier," there being twelve numbers, one for each month of the year.

Desvaux's Journal de Botanique as they were issued. There would therefore appear to be no cause for doubting the correctness of the dates of issue as originally published, for Desvaux apparently was able to live up to his plan of issuing a number each month and in the first eight days of each month; in fact some of the numbers actually were printed in the month preceding the one indicated on the fascicle covers.

The record as to the dates of issue of the "second series" is unfortunately not so clear and doubts have been cast on the correctness of some of them. It was Desvaux's original plan to start an entirely new periodical in 1810 as noted above, but apparently the times were not propitious. Three years later he did initiate another serial but used the same general title that he had for the first attempt, i.e., Journal de Botanique. Of this new serial four volumes were issued, the third volume apparently never completed.

Fernald, Rhodora 20: 227. 1927, in his discussion of *Dendrium* Desv. and *Loiseleuria* Desv., for which he correctly accepts the date of publication as 1813, says: "Nevertheless, European bibliographers apparently have recent information (its source as yet unknown to me) that the part of vol. iii, or Ser. 2: 1, containing *Dendrium* (p. 36) and *Loiseleuria* (p. 35) was not issued until 1814." However, No. 1, pp. 1–48, although neither the number nor the pagination is indicated, is clearly the part reviewed in the Jour. Gén. Litt. France 16: 30. 1813, as determinable from the titles of the papers cited. This would be the January number for the year 1813 and the entry proves that number one of this new Desvaux Journal de Botanique was actually issued in 1813 and not delayed until 1814. My attention had been called to an item in Bertolini's Flora Italica 2: 377. 1835, in his discussion of *Primula suaveolens* R. & S. in which he refers to an entry in Desvaux's Journal de Botanique "tom. 4. p. 76. anno 1813," which seemed to confuse the issue. Checking the reference, however, indicated an error on Bertolini's part, for the *Primula suaveolens* entry is in Desvaux's Jour. Bot. 2: 76. 1813, not in volume four, again confirmation that volume two was issued in 1813.

As Fernald notes, the signatures (every 16 pages) are dated at the bottom of the first page of each beginning with p. 49, February, 1813, and continuing to June, 1813 (p. 273). It is not claimed that these monthly dates are actually the dates of issue, but this might well be the case. This system of dating the signatures was continued through volume 2, p. 1, July, 1813, to p. 257, December, 1813, but was abandoned in volumes three and four. Volumes three and four are dated 1814. On page 285 of volume four Desvaux says: "Les trois derniers Numéros du 3.e volume pour 1814, paraîtront avec les premiers Numéros du 5.e volume commençant l' année 1815." This explains, in part, the incomplete volume three but throws no light on the difficulties that the editor may have had with the printers. In all but one of the sets of this periodical that I have seen, volume three closes abruptly with page 192, and I judge that it was

Desvaux's plan to issue four numbers of 48 pages each. It is worthy of note that the set in the library of the New York Botanical Garden contains pages 193 to 240 of the volume under discussion, this indicated as no. 5, May, 1814. But a footnote on page 197 clearly indicates that it could not have been published before February, 1816; see Hazen, Bull. Torr. Bot. Club 56: 531. 1929. The fifth volume promised by Desvaux for 1815 never appeared, and apparently also only certain fugitive issues of the last part or parts of volume three for 1814 were actually distributed. I know of only the New York copy of vol. 3, no. 5, never having seen a reference to an existing copy of no. 6. I have seen no fascicle covers of any of the numbers of this second run of Desvaux's Journal de Botanique. Apparently the unsettled conditions in Paris associated with the fall of the first empire in 1814, and the first year or two of the restoration were not conducive to regularity in publication of technical periodicals.

ARNOLD ARBORETUM,
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ON THE IDENTITY OF BRANDISIA SOULIEI BONATI

E. D. MERRILL

With one plate

ON EXAMINING the proofs of Dr. Li's paper on *Brandisia*, this Journal, p. 136 his correct elimination of Bonati's species as a representative of this genus was noted. At the time Li's paper was prepared it was impossible to secure special information from European centers. With the improvement in communications following the termination of hostilities it impressed me as desirable to see if the excluded Bonati species of *Brandisia* could be more definitely placed. Suspecting that the type was preserved in the Paris herbarium I appealed to Dr. H. Humbert of the Muséum d'histoire naturelle, who courteously sent me an excellent photograph of the holotype. An examination of this rather clearly indicated that the family Scrophulariaceae was not involved but that probably *Brandisia Souliei* Bonati actually belonged in the Labiatae.

Turning to Bonati's description it is evident that he did not examine the structure of the ovary, for all that he says regarding the innermost set of floral organs is "stigmate bifido, lobis brevissimis. Capsula ac semina?" Feeling that it was essential that the structure of the ovary be checked I appealed to Dr. F. Gagnepain who reëxamined the type and reported: "Je me hâte de vous informer: Que cette espèce est une Labiacée; 1° parce qu'elle a le stigmate particulier à cette famille; 2° parce que j'ai vu très nettement au moins 2 nucules sur le podogyne au fond du calice. La chose est donc jugée; ce n'est pas une Scrophularicée. Je n'ai pas eu le temps de faire de plus amples recherches et de trouver le genre de Labiacées auquel appartient cette espèce litigieuse."

On the basis of the additional information courteously supplied by Dr. Gagnepain, the conclusion was reached that the genus *Chelonopsis* Miquel (Labiatae), as currently interpreted, was represented by Bonati's species, and after a consideration of the published descriptions of the proposed species that further *Brandisia Souliei* Bonati (1909) was identical with *Chelonopsis albiflora* Pax & K. Hoffm. (1922). So convinced am I as to the specific identity of the two, one erroneously placed in the Scrophulariaceae, the other correctly in the Labiatae, that on the basis of the original descriptions and without having seen specimens representing either of the species, the Pax and Hoffman one is reduced to synonymy and the following adjustment in nomenclature is made:

Chelonopsis Souliei (Bonati) comb. nov.

Brandisia Souliei Bonati, Bull. Soc. Bot. France 56: 467. 1909.

Chelonopsis albiflora Pax & K. Hoffmann ex Limpricht in Repert. Sp. Nov. Beih. 12: 477. 1922.

The species is apparently known only from the collections on which the two descriptions were based, and all three of the cited specimens came from Batang [Pa-an], Province, Eastern Tibet [=Sikang Province, China], *Soulie 5199*, "Yargòng," collected in 1904 and *Limpricht 2221, 2230* "Bejü-Batang" and "Batang-Litang," collected in 1914, the last two numbers being the basis of *Chelonopsis albiflora* Pax & K. Hoffm. "Batang" is Pa-an, and what Soulie and Limpricht designated as eastern Tibet, at least as to the "Batang" plants, is now Sikang Province, China.

The published descriptions agree with each other closely. One of the striking characters even in *Chelonopsis*, is that most of the leaves are in whorls of threes. The three collections came from the same general region, but unless duplicates of the Limpricht collections were distributed to other centers previous to the destruction of the Berlin herbarium, perhaps the Bonati collection is the sole extant representative of the species.

Naturally a botanist studying the Labiatae as did Dunn* in his consideration of the Labiatae of China cannot be censured for having overlooked a species erroneously described some years earlier and misplaced in the system not only as to the genus but also as to the family; Dunn recognized four species of *Chelonopsis* as occurring in China. Nor can Pax and Hoffman be blamed for overlooking an ample earlier description of a species that they described as new and for the same reason. This is an excellent illustration of the fact that to describe a new species is a very simple procedure, but to place a suspected new species in its proper group and to determine whether or not a proposed species is actually "new," (i.e., previously unnamed and undescribed) is another matter.

EXPLANATION OF PLATE

PLATE I

Photograph of the holotype of *Brandisia Souliei* Bonati = *Chelonopsis Souliei* (Bonati) Merrill. Courtesy of Dr. H. Humbert, Muséum d'histoire naturelle, Paris.

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* DUNN, S.T. A Key to the Labiatae of China. Notes Bot. Gard. Edinb. 6: 127–208. 1915.

Chelonopsis Souliei (Bonati) Merrill

NOTES ON SOME CULTIVATED TREES AND SHRUBS, V

Alfred Rehder

Chamaecyparis obtusa f. **Sanderi** (Sander), comb. nov.

Juniperus Sanderi Sander ex Masters in Gard. Chron. ser. 3, **25**: 287 (1889), nom. subnud. — Beissner in Mitt. Deutsch. Dendr. Ges. **1899**(8): 116 (1899), pro syn. — Unger in Mitt. Deutsch. Dendr. Ges. **1900**(9): 69 (1900), pro syn. — Anon. in Möller's Deutsch. Gärtn.-Zeit. **15**: 589, fig. (1900), nom. subnud.; cf. p. 246, 428.

Chamaecyparis obtusa ericoides hort. Jap. ex Boehmer, Cat. **1899–1900** (suppl.): 2 (1899), nom. nud. — Beissner in Mitt. Deutsch. Dendr. Ges. **1901**(10): 77 (1901), nom. subnud.; **1903**(12): 51 (1903, Dec.); in Möller's Deutsch. Gärtn.-Zeit. **18**: 291, fig. (1903, June 20); Handb. Nadelh. ed. 2, 556, fig. 142 (1909). — Hornibrook, Dwarf Conif. 41, fig. (1923) "var." — Rehder in Bailey, Cult. Evergr. 216, fig. 41 (1923). — Non *Retinispora obtusa* var. *ericoides* Hoopes (1868).

Retinispora Sanderi (Hort.) Sander in Gard. Chron. ser. 3, **33**: 266, fig. 111 (1903); no. 852 (Suppl.), fig. 107 (p. ii) (1903, April 25), nom. subnud.

Cupressus pisifera var. *Sanderi* Dallimore & Jackson, Handb. Conif. 219 (1923), nom. tentat.

Juniperus sabina Ungeri Anon. in Gartenwelt, **33**: 290, fig. (1929).

Juniperus sabina Sanderi Anon. in op. cit. 291 (1929), pro syn.

This juvenile form has been listed by most recent authors as *Chamaecyparis obtusa ericoides* Boehmer, a nomen nudum first validated in 1909 by Beissner (l.c.). This name, however, should be considered a later homonym of *Retinispora obtusa* var. *ericoides* Hoopes (1868), since *Retinispora obtusa* Sieb. & Zucc. and *C. obtusa* Endl. are synonymous. *Retinispora obtusa* var. *ericoides* Hoopes is based chiefly on *Chamaecyparis ericoides* Carr. (1855); there can, however, be no doubt that *C. ericoides* Carr. does not belong to *C. obtusa*, but represents a juvenile form of *C. pisifera*, namely *C. pisifera* f. *squarrosa* [Zucc.] Beiss. and partly *C. thyoides* f. *ericoides* (Carr.) Rehd. As the epithet *ericoides* has been applied to forms under three different species in the genus *Chamaecyparis*, and may therefore cause confusion, its rejection in favor of *Sanderi*, about which there can be no doubt as to the plant meant by it, is in accordance with the spirit of the Rules of Botanical Nomenclature (see Art. 4), even if *Retinispora obtusa* var. *ericoides* Hoopes and *Chamaecyparis obtusa* var. *ericoides* Beissner are not homonyms in the strict sense of the word; moreover, the first two figures of this plant were published under the names *Juniperus Sanderi* and *Retinispora Sanderi*.

In the note in Gard. Chron. ser. 3, **25**: 287 (1899) on *Juniperus Sanderi*, it is stated that *J. Sanderi*, a Japanese species, was introduced by F. Sander & Co., about 1896, but I have not been able to verify this statement.

Carya sect. I. **Pacania** (Raf.), comb. nov.
Hicoria subgen. *Pacania* Rafinesque, Alsogr. Am. 65 (1838).
Hicoria subgen. *Drimocarya* Rafinesque, l.c. (1838), p.p.
Carya sect. II. *Apocarya* C. de Candolle in De Candolle, Prodr. 16.2: 144 (1864).
Hicoria sect. *Apohicoria* Dippel, Handb. Laubh. 2: 336 (1892).
Hicoria [sect.]. *Apocarya* Sargent, Silva N. Am. 7: 135 (1895).

The oldest subdivisional name for this section has been generally overlooked, but as it was validly published with a description and reference to the species belonging to it, it must replace the name *Apocarya* C. de Candolle. For the second group, I have retained the name *Eucarya* C. de Candolle, since its circumscription agrees exactly with that adopted here, while it seems doubtful which of the names of the three subgenera into which this group was split by Rafinesque should have preference.

×Malus purpurea (Barbier) Rehder f. **pendula** (Bean) Rehder, comb. nov.
×*Pyrus purpurea* var. *pendula* Bean, Trees Shrubs Brit. Isl. 3: 327 (1933).

This is a pendulous form of × *M. purpurea* (Barbier) Rehder (in Jour. Arnold Arb. 2: 57. 1920), a hybrid between × *M. atrosanguinea* [*M. Halliana* Koehne × *Sieboldii* (Regel) Rehder] and *M. pumila* var. *Niedzwetzkyana* (Dieck) Schneider. No mention is made by Bean, who published the first reference to it, when and where this form originated.

Rhododendron macrophyllum G. Don f. **album**, f. nova.

A typo recedit flore albo.

OREGON: Junction City, Lane Co. *J. E. Barto*, May 3, 1930 (in herb. Arnold Arb.).

The specimen collected by J. E. Barto bears on the label the varietal epithet *album* which agrees with the fact that its flowers are white even in bud. This is the only specimen with white flowers in the herbarium of the Arnold Arboretum and there is none at all in the Gray Herbarium; all other specimens collected in flower have the corolla more or less rose-colored to rose-carmine. In none of the floras of the West Coast is any mention made of a white-flowered form, although the original description of *R. macrophyllum* G. Don (Gen. Hist. Dichlam. Pl. 3: 843. 1834) says: "*corolla alba*"; only those later authors who keep *R. macrophyllum* and *R. californicum* as distinct species describe the flowers of the former as smaller and white. This separation is apparently only based on the color as given in G. Don's description. It appears, however, that G. Don was in error when he ascribed white flowers to this Rhododendron collected by Menzies at Port Townsend, for in his journal edited by C. F. Newcombe in 1923, under the title "Journal of Vancouver's Voyage, April to October, 1792" Menzies refers twice to this Rhododendron, on p. 20* as *R. ponticum* and on p. 49 as "that beautiful native of the Levant, the purple Rhododendron"; apparently he identified the Rhododendron of the Vancouver region which is in general appearance similar to *R. ponticum* L., with that species he knew from Europe and probably from plants cultivated in England, whence it was introduced in 1763 from Gibraltar. As there

* Called by the editor *R. californicum* in a marginal note.

occurs no other species of the subgenus *Eurhododendron* on the West Coast of North America but *R. macrophyllum* G. Don (*R. californicum* Hook.), the specimens collected by Menzies and compared by him with the purple flowered *R. ponticum* could not have been the apparently extremely rare white-flowered form; the explanation seems to be that the flowers of the specimens were faded and discolored and looked as if they might have been white, as they do in some of the more recently collected specimens before me.* Don also describes the filaments as glabrous, which they are not, not even in the white-flowered form; they are densly pubescent at least at the lower third. A specimen from the type-locality, Port Townsend, Jefferson Co., coll. J. Wm. Thompson, no. 10639, June 9, 1934, has pink flowers up to 6 cm. across and rather large leaves, 9–15 cm. long. Size and color of the flowers are not concomitant characters, nor have they any connection with the geographical distribution; a specimen from Monterey has one of the smallest flowers that I have seen, about 3 cm. across and they are pink.

Ligustrum sect. **Euligustrum**, nom. nov.

Ligustrum sect. III. *Baccatae* Mansfeld in Bot. Jahrb. 59, Beibl. 132: 42 (1924).

Decaisne was the first to subdivide the genus into groups of which he distinguished four without, however, giving names to his sections [in Fl. des Serres, **22**: 4–11 (1877) and in Nouv. Arch. Mus. Hist. Nat. Paris, sér. 2, **2**: 17–37 (Monog. Ligustrum Syringa.) (1879)]. Of the first of these sections characterized by "Flores hypocrateriformes" Koehne published in 1904 as sect. *Ibota* a monographic treatment in Festschr. 70 Geburtst. Ascherson, 189–208, 4 fig. (Abstract in Mitt. Deutsch. Dendr. Ges. **1904** (13): 68–76, 6 fig. [1905]). In 1924 Mansfeld divided the genus into three sections and the second section into two subsections, using for his section III, a form of name contrary to usage and, moreover, the adjectives in plural are treated as of feminine gender which is grammatically incorrect (see also my proposal of changes of Art. 26 of the Rules of Botanical Nomenclature in Jour. Arnold Arb. **20**: 269. 1939). I propose, therefore, to change the name sect. *Baccatae* to sect. *Euligustrum*, since it contains the type-species of the genus.

Ligustrum vulgare f. **nanum** (Kohankie), grad. nov.

"Privet Lodense" (*Ligustrum nanum compactum*) Jackson & Perkins, Fall-Price-List, **1924**: 15 (1924), cum descr.

Ligustrum lodense Glogau in Gartenwelt, **32**: 658 (1928), nom. subnud. — Henry Kohankie & Son, Price List, Fall **1930**: 54 (1930). — Rehder, Man. Cult. Trees Shrubs, ed. 2, 784 (1940) "Lodense."

Ligustrum vulgare nanum Henry Kohankie & Son, Price List, 1945 46: 76 (1945), nom.

A typo speciei recedit habitu compacto nano, 0.75 m. vix excedente,

* Of an original specimen of *R. macrophyllum* collected by Menzies and preserved in the herbarium of the British Museum of Natural History, Mr. J. Ramsbottom kindly sent me a photograph recently taken by Dr. Bernice Schubert, and informed me that the flowers showed a uniform light brown color and might easily have been taken as having originally been white.

ramis erectis vel suberectis. Folia ovato-oblonga vel rarius anguste oblonga, 2–4 cm. longa et 0.6–1.5 cm. lata, obtusa vel acutiuscula, basi late cuneata vel cuneata.

CULTIVATED SPECIMENS: Arnold Arboretum, no. 710–37 (no. 18331) and no. 977–25, *A. Rehder*, Sept. 12 and Oct. 5, 1946.

This form of *Ligustrum vulgare* differs from the typical form in its dwarf and compact habit, with upright and ascending branches. It originated in the nursery of Henry Kohankie & Son at Painesville, Ohio, some time before 1924 and was first offered for sale in 1924 by Jackson & Perkins under the name "Privet Lodense" with the descriptive synonym *Ligustrum nanum compactum* added in parenthesis. The word "Lodense" does not represent, as seems to have been assumed by some, a Latin adjective, but is formed by contracting the two words "low" and "dense," descriptive of the habit of the plant; it is intended as the English or horticultural name of this plant and should not be considered a botanical epithet.

Ligustrum ovalifolium f. **aureum** (Carrière) Rehd., grad. nov.

Ligustrum ovalifolium aureum Carrière in Rev. Hort. **1862**: 314 (1862). — Bean, Trees Shrubs Brit. Isl. **2**: 27 (1914) "var."

Ligustrum ovalifolium variegatum Bull ex T. Moore in Proc. Hort. Soc. Lond. **5**: 138, 144 (1865).

?*Ligustrum japonicum* var. *tricolor* Jacob-Makoy, Cat. no. 114 (1870) ex E. Morren & C. de Vos, Index Bibliogr. Hort. Belg. 555 (1887), nom. — Meehan in Meehan's Monthly, **2**: 42, fig. (1892) "tricolored"; nom. subnud.

Ligustrum californicum robustum variegatum Carrière in Rev. Hort. **1877**: 352 (1877).

Ligustrum ovalifolium robustum aureo-marginatum hort. ex Dippel, Handb. Laubh. **1**: 135 (1889).

Ligustrum californicum aureum hort. et *L. elegantissimum* hort. ex [Nicholson] Kew Hand-List Trees Shrubs, **2**: 93 (1896), pro syn.

Ligustrum ovalifolium var. *aureo-marginatum* Hort. ex Rehder in Bailey, Cycl. Am. Hort. [2]: 913 (1900); Man. Cult. Trees Shrubs, ed. 2, 786 (1940).

Ligustrum ovalifolium var. *robustum variegatum* Hort. ex Rehder, l.c. (1900), pro syn.

Ligustrum ovalifolium aureo-variegatum hort. ex Schelle in Beissner et al., Handb. Laubh.-Ben. 418 (1903), nom.

There can be but little doubt that all the names cited above belong to *Ligustrum ovalifolium* f. *aureum*, except perhaps the doubtful *L. japonicum* var. *tricolor* Jacob-Makoy, of which I have seen no specimen; certainly Meehan's figure of it does not represent a form of *L. japonicum* Thunb. which has coriaceous evergreen leaves and would not be hardy near Philadelphia. Moreover, the name *L. japonicum* has often been applied in garden and horticultural literature to *L. ovalifolium*.

Ligustrum Vicaryi (Beckett) (*L. ovalifolium* f. *aureum* × *L. vulgare*), hybrida nova.

Ligustrum Ibota aureum Vicarii E. Beckett in Aldenham House Garden Surpl. Pl. **1923**: 14 (1923); **1929**: 27 (1929), nom. subnud.

Ligustrum Ibota Vicaryi Lemoine, [Cat.] no. 198(1924-25): 11 (1924), nom. subnud. — Besant in Gard. Chron. ser. 3, **100**: 82 (1936) "var."

Frutex ramulis glabris. Folia elliptica vel ovato-elliptica, 2–4, rarius ad 6–7 cm. longa, acuta vel breviter acuminata, ad basin ramulorum

minora 1.5–2 cm. longa et interdum obtusiuscula, basi late cuneata, glabra, partim lutea, petiolis 2–4 mm. longis. Panicula 3–6 cm. longa, axi et ramulis sparse et minute puberulis; pedicello et calyce glabro; corolla tubo 3 mm. longo, longitudinem limbi dimidio excedente; staminibus limbum paullo excedentibus vel subaequilongis. Fructus subglobosus, 4 mm. diam.

CULTIVATED SPECIMENS: Arnold Arboretum, no. 332–36 (from New York Botanic Garden as *L. ciliatum Vicaryi*), *A. Rehder*, July 1 and October 5, 1946, (TYPE); no. 668–33 and 500–36 (from Boyce Thompson Inst., Yonkers, N. Y., as *L. ciliatum Vicaryi*), *E. J. Palmer*, July 5 and October 17, 1938; Hort. Vilmorin, Verrières, France, *Roger L. de Vilmorin*, 1927; Coolidge Coll., San Diego County, Calif., July 1919 and May, 1920, *F. G. W.* (as *Ligustrum* sp.).

This Ligustrum apparently originated some time before 1920 in the garden of Vicary Gibbs of Aldenham, Middlesex, England, famous for his collection of rare trees and shrubs. Its characters suggest a cross between *Ligustrum ovalifolium* f. *aureum* and *L. vulgare*. In its general appearance it resembles very much *L. ovalifolium* f. *aureum*, but the influence of *L. vulgare* is indicated by the more compact and smaller inflorescence with its axis and branchlets puberulous, and particularly by the shorter corolla-tube which is only about $1\frac{1}{2}$ times as long as the corolla-lobes, while in *L. ovalifolium* it is two to three times as long as the lobes, and in *L. vulgare* shorter than the lobes. The shape of the leaves is much like that of *L. ovalifolium*, but the variegation is more irregular than in its f. *aureum* and the leaves of the weaker branches are often entirely green. Since writing the preceding description proposing this plant as a hybrid of *L. vulgare* and *L. ovalifolium*, my attention has been drawn to a note by J. W. Besant in Gardeners' Chronicle (l.c.) in which he calls *L. Ibota* var. *Vicaryi* "a variant from the common and oval-leafed Privets" which apparently means a hybrid between *L. vulgare* and *L. ovalifolium*. It may be considered a confirmation of the correctness of calling this plant a hybrid between these two species, that the same explanation of its origin is based on two entirely different and independent sources. The fact that the pollen of this plant is normal can not be considered a proof against its hybrid origin, for pollen sterility, though prevalent in hybrids, cannot be considered an infallible character of hybridity, for there are hybrids with normal pollen, as × *Platanus acerifolia* (Ait.) Willd. (*P. occidentalis* × *orientalis*).

Ligustrum Tschonoskii Decne. var. **macrocarpum** (Koehne), comb. nov.

Ligustrum macrocarpum Koehne in Festschr. 70. Geburtst. Ascherson, 201, fig. 3, B (1904); in Mitteil. Deutsch. Dendr. Ges. 1904 (13): 76, fig. 6 [1905]; in Repert. Sp. Nov. Reg. Veg. 1: 10 (1905).

Ligustrum medium hort. ex Koehne, op. cit. 203 (1904), pro syn.; non Franchet & Savatier [1878].

Ligustrum acuminatum var. *macrocarpum* Schneider, Ill. Handb. Laubh. 2: 807, fig. 508 l-n (1911).

Ligustrum ciliatum var. *macrocarpum* Mansfeld in Bot. Jahrb. 59, Beibl. 132: 68 (1924).

As *L. macrocarpum* is apparently not specifically different from *L. Tschonoskii*, the above new combination becomes necessary.

Vitex Negundo L. var. **heterophylla** (Franch.), comb. nov.

Vitex chinensis Miller, Gard. Dict. ed. 8, *V.* no. 5 (1768). — Nakai, Fl. Sylv. Kor. 14: 38, t. 12 (1923).

Vitex incisa Lamarck, Encycl. Méth. Bot. 2: 612 [1788]. — Bunge in Mém. Div. Sav. Acad. Sci. St. Pétersb. 2: 126 (Enum. Pl. Chin.-Bor. 52. 1833) (1835). — Merrill in Lingnan Sci. Jour. 5: 158 (1927).

Vitex Negundo sensu Curtis in Bot. Mag. 11: t. 364 (1797), non Linnaeus (1753).

Vitex laciniatus Hort. ex Schauer in De Candolle, Prodr. 11: 684 (1847), pro syn.

Agnus castus incisa Carrière in Rev. Hort. 1870: 415 (1871).

Vitex incisa var. *heterophylla* Franchet in Nouv. Arch. Mus. Hist. Nat. Paris, ser. 2, 6: 112 (Pl. David. 1: 232. 1884) (1883). — Rehder in Sargent, Pl. Wilson. 3: 374 (1916), in obs.

Vitex Negundo var. *incisa* (Lam.) C. B. Clarke in Hooker f., Fl. Brit. Ind. 4: 584 (1885). Rehder in Sargent, Pl. Wilson. 3: 373 (1916). — P'ei in Mem. Sci. Soc. China, 1,3: 106 (Verbenac. China.) (1932).

The above new combination was necessary since according to Art. 58 of the Rules of Botanical Nomenclature the oldest varietal name has to be used for the new ternary combination.

As I stated in the discussion under *Vitex Negundo* var. *incisa* (in Sargent, Pl. Wilson. 3: 374. 1916) Franchet's *V. incisa* var. *heterophylla* can hardly be separated as a distinct variety or form from *V. Negundo* var. *incisa* (Lam.) C. B. Clarke, and if united, Franchet's varietal name has priority over *V. Negundo* var. *incisa* (Lam.) C. B. Clarke.

Vitex Negundo var. **heterophylla** f. **multifida** (Carr.), comb. nov.

Agnus castus incisa var. *multifida* Carrière in Rev. Hort. 1870: 416 [1871].

Vitex incisa var. *multifida* Schneider, Ill. Handb. Laubh. 2: 594, fig. 384m-n (1911).

Vitex Negundo var. *incisa* f. *multifida* (Carr.) Rehder in Bailey, Stand. Cycl. Hort 6: 3481, 3574 (1917) "*V. N.* f. *multifida*," p. 3574.

A form of *V. Negundo* var. *heterophylla* with deeply pinnatifid leaflets and narrow remote segments.

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NOTES ON TWO SPECIES OF ARAUCARIA IN NEW GUINEA AND A PROPOSED NEW SECTION OF THE GENUS

C. T. White

On my way back to Australia from the Solomon Islands in November, 1945, I was delayed at Lae in New Guinea, awaiting transport, and decided to visit the Bulolo Valley at Wau for the purpose of seeing the fine Araucaria forests of that region.

Before the war, Wau was the centre of the gold-mining industry of the Mandated Territory of New Guinea, and the town and surrounding district carried a white population of approximately 2000. Lack of transport had fortunately prevented the exploitation of the magnificent forests of *Araucaria Klinkii* Lauterb. and *A. Cunninghamii* Ait. These two species grow intermingled and dominate the rain-forest on the ridges and hillsides. The former is an especially magnificent tree and Mr. J. B. McAdam, Chief of the New Guinea Forest Service, informs me that he still hopes to find a specimen 300 ft. high. By actual measurement he has found trees approaching this height, but not quite attaining it. The following notes on their systematics and their distribution in New Guinea are offered.

Araucaria Cunninghamii Ait. in Sweet, Hort. Brit. 475. 1827; F. Muell. Vict. Nat. 4: 121. 1887, Descript. Notes Pap. Pl. 9 (2): 65. 1890; Lauterb. in Engl. Bot. Jahrb. 50: 51. 1913; C. E. Lane-Poole, Forest Resources Papua and New Guinea 73. 1925; C. T. White in Jour. Arnold Arb. 10: 200. 1929.

New Guinea: Mt. Obree, Sayer (ex Lauterb. l.c.), *C. E. Lane-Poole 376*, Feb. 1921 (young cones); Hanep, common along the ranges on each side of the Ramu from 2000–4000 ft. alt., *C. E. Lane-Poole 639*, Feb. 1924 (immature cones); Owen Stanley Range, between Mts. Brown and Clarence, *L. J. Brass*, May 1926 (leaves only); Wau, alt. 3000 ft., common on ridge rain-forest above the Bulolo River, *C. T. White*, N.G.F. *1465*, Nov. 1945 (young cones and broken fallen cones; large tree 150 ft., bark thick rough, dark brown almost blackish).

Distribution: E. Australia and E. New Guinea.

Lauterbach, l.c., mentions that he could find no difference between Sayer's specimen and the type from E. Australia. The species is abundant in Eastern New Guinea on the Owen Stanley Range and ranges north of it. The trees in the field are very similar to those of Australia, where the species is very common from sea-level to an altitude of 3000 ft. and shows considerable variation in form. I have compared the New Guinea specimens available to me with much Australian material and can find no essential differences. The closely allied *A. Beccarii* Warb. from north-west New Guinea, judging from figures published by Miss Gibbs in the Phytogeography and Flora of the Arfak Mts., p. 84, fig. 5, seems to differ chiefly in the very much larger cone and cone-scales, the latter measuring 4 cm. × 8 cm. (exclusive of the indurated point) whereas in *A. Cunninghamii* Ait. they only average half this size.

Araucaria Klinkii Lauterb. in Engl. Bot. Jahrb. 50: 48. 1913; C. E. Lane-Poole, Forest Resources Papua and New Guinea 72. 1925.

NEW GUINEA: Mountains of the Upper Waria River, 2000 m. and more above sea level, *Klink*, TYPE, Nov. 1910 (ripe cones); mountains behind Finschhafen, alt. 2000–3000 ft., on the hills of the Upper Ramu River, *C. E. Lane-Poole 642* (leaves only); Wau, alt. 2500 ft, abundant in rain-forest ridges and hillsides above the Bulolo Valley, *C. T. White*, N.G.F. *1454*, Nov. 1945 (green male amenta and fallen cones; large tree 200 ft., bark very dark brown thick and rough).

As is well known, the species of *Araucaria* fall naturally into two well-defined sections:

(1) COLYMBEA Endl. in which the leaves in adult trees are large and more or less spreading, the cones large, the seeds heavy and not adapted to wind-distribution, cotyledons hypogeal, endosperm transferred in germination into the underground swollen hypocotyl.

(2) EUTACTA Endl. in which the juvenile leaves are acicular and spreading, the adult ones small and imbricate, the seeds comparatively light and with the accompanying winged scale, adapted to wind-distribution, cotyledons epigeal and spreading in germination like those of *Pinus*, hypocotyl slender.

Lauterbach (l.c.) placed *A. Klinkii* Lauterb. in the section EUTACTA, where I feel that its true affinities lie. However, Pilger in the second edition of Die Natürlichen Pflanzenfamilien transferred it to the section COLYMBEA. The only affinity with this section is the large size and more or less spreading character of the leaves. He also includes here the closely allied *A. Hunsteinii* K. Sch. and *A. Schumanniana* Warb. Warburg (Monsunia 1: t. 10) figures both these species and shows their leaves to be more spreading than in *A. Klinkii* Lauterb. In the field, on the general appearance of the branchlets, these three trees certainly resemble members of the section COLYMBEA more than EUTACTA, but in the more essential features, the character of the seed and scale, and the method of germination, they definitely agree with the section EUTACTA. The description of EUTACTA could be amended to include these New Guinea species, but it seems preferable to propose a new section to include them.

Sectio **Intermedia** sect. nov.

Folia juvenilis acicularia, patentia, parva, adulta magna (5–10 cm. longa) patentia vel leviter imbricata; semina cum squamis alatis a ventis disseminata, cotyledonibus 2 in germinatione patentibus supra terram portatis.

Three species in North-east New Guinea, *A. Hunsteinii* K. Sch., *A. Schumanniana* Warb. and *A. Klinkii* Lauterb. though it is possible that all three represent forms of one rather variable species. The two former are unfortunately known only from the type localities.

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A MONOGRAPH OF THE GENUS ACRANTHERA ARN. EX MEISN. (RUBIACEAE)

C. E. B. BREMEKAMP

With two text-figures

INTRODUCTION

A. THE IDENTITY OF PSILOBIUM JACK, ACRANTHERA ARN. EX MEISN. AND GONYANERA KHS.

JACK DESCRIBED IN 1822 (Mal. Misc. 2: 84) a new genus *Psilobium* based on two species discovered by him during his travels in Benkulen. The specimens which served for the descriptions have been lost. As the descriptions are rather short and give no measurements, it appears almost impossible to identify these plants. At least, as long as we are not absolutely sure that in this region not more than two species belonging to this genus occur, there can be little hope.

The genus was characterized in this way:

"*Psilobium* (W. J.); *Pentandria Monogynia;* N. O. *Rubiaceae* Juss.

Calyx patens, 5-partitus. Corolla tubo brevi, limbo 5-partito. Stamina basi corollae inserta. Stigma clavatum, 10-alatum, exsertum. Fructus cylindricus, siliquaeformis, foliolis calycinis persistentibus coronatus, bilocularis, polyspermus. Semina duplici serie axi affixa.

Fruticosa, pedunculis axillaribus paucifloris, aestivatione valvata."

For the determination of its position the following points are of special importance: the many-seeded fruit, the valvate aestivation of the corolla-lobes, the insertion of the stamens at the base of the corolla-tube, the clavate "stigma" (in reality that part of the style is meant on which the pollen is temporarily deposited, and from which it is afterwards removed by visiting insects), and the presence in each of the ovary-cells of two parallel axial placentas. The many-seeded fruit and the valvate aestivation of the corolla-lobes, it is true, appear in a large number of genera, but the other characters are much more exclusive; in fact, there are but

two other genera in which the whole set has been observed. These genera are: *Acranthera* Arn. ex Meisn. and the very imperfectly known *Gonyanera* Khs., the first based on a Ceylonese plant, the latter, like *Psilobium*, on a Sumatran plant.

It may be that Arnott when he described his new genus *Acranthera*, was not aware of the existence of *Psilobium* Jack, but it is also possible that he overrated the importance of the differences between the species on which his own and Jack's generic diagnoses have been based. The latter concern the position of the inflorescences, the presence or absence of a disk, and the structure of the ovary and fruit. The inflorescence of the Ceylon plant is found between the upper leaves, its disk is large and bulbous, and its ovary and fruit are according to Arnott "pseudo-bilocular," i.e. provided with an incomplete septum. In the Sumatran plants, on the other hand, the inflorescences have been described as axillary. The presence of a disk is not mentioned in Jack's description, and we may therefore assume that this organ is either absent or inconspicuous, and the ovary and fruit apparently are completely bilocular. The difference in the structure of the ovary and fruit afterwards proved to be untrue, for the median rent observed by Arnott in the septum, was, as Stapf (in Trans. Linn. Soc. II. 4: 173. 1894) pointed out, due to rough handling. All the same, it does not appear that Arnott attached much value to this character, for the supposed incompleteness of the septum did not withhold him from considering *Acranthera* a near ally of *Mussaenda* L., in which the septum certainly can not be regarded as imperfect. The two other points of difference are, as I will show further on, real enough, and might be considered a sufficient base for generic distinction. The authors, however, who subsequently occupied themselves either with *Psilobium* or *Acranthera*, did not see them in this light, for they indiscriminately referred to each of these genera species with or without a disk and with the inflorescences at the end of the stem as well as with opposite inflorescences. The Sumatran species of *Acranthera* described by Merrill (in Papers Mich. Acad. Sci. 19: 194. 1934) e.g. are, exactly like the *Psilobium* species of Jack, provided with opposite inflorescences, whereas *Psilobium siamense* Kerr produces its inflorescence exactly like Arnott's *Acranthera* species, at the top of the stem, and is also, like the latter, provided with a large bulbous disk. The explanation of this anomaly lies therein that those who occupied themselves with *Psilobium*, were insufficiently acquainted with *Acranthera*, whereas those who described new species of the latter, gave no heed to the existence of *Psilobium*.

As long as no specimens were available which could be referred to *Psilobium*, the position of this genus remained uncertain. It is true that already in 1872 a plant occurring in Pegu and Tenasserim had been described by Kurz (in Jour. As. Soc. Bengal 41(2): 313) as *Psilobium capillare*, but as the aestivation of its corolla-lobes is contorted, its flowers dioecious, its style provided with two erect hairy arms, and its placentation peltate, this obviously was a mistake; the plant can not even be considered

a near ally. Two years later Kurz himself (in Jour. As. Soc. Bengal 46: 189. 1874) recognized it as conspecific with the unnamed plants on which Hooker f. had based his genus *Morindopsis*.

In 1925, i.e. more than a century after the publication of Jack's paper, for the first time a plant was referred to *Psilobium*, of which there is no doubt that it fits Jack's generic description. It is a specimen discovered by Ridley among the plants collected by Brooks in Benkulen. Ridley refers to it in the following terms (in Kew Bull. 1925: 84. 1925):

"*Psilobium nutans* Jack. Lubok Tandai, herb, in shade, common, flowers white green, 6681.

I take this to be the long-lost *Psilobium* of Jack, obtained at Bencoolen. It agrees in almost all points with the description, but the calyx-lobes are described by him as "very large" which though they are fair size, hardly agrees with this."

I have not been able to study this specimen, and the data given by Ridley certainly do not prove that it really belongs to *Psilobium*. The lacking evidence, however, has been supplied by Kerr in the description of his *Ps. siamense* (in Hooker's Ic. Pl. 34: t. 3332. 1937). This species namely is said to differ from the plant collected by Brooks in the larger size of the flowers, the narrower calyx-lobes, the included sexual organs and the terminal position of the inflorescence, and must be assumed, therefore, to resemble the latter in all other points mentioned in his description. As the fruits of *Ps. siamense* are described as many-seeded, the aestivation of its corolla-lobes as valvate, the stamens as inserted at the base of the corolla-tube, the style as clavate, and the placentas as paired and axial, the set of characters by which the taxonomic position of the genus is determined, must be present in Brook's specimen too.

Although it can, therefore, hardly be doubted that the plant collected by Brooks fits Jack's generic description, it can not be admitted that it is conspecific with *Ps. nutans*, the type-species of Jack's genus. According to Ridley's own remarks it does not fully agree with the description but merely "in almost all points," its calyx-lobes notably not being "very large" but of "fair size" only. Ridley's identification, therefore, can not be accepted. The specimen collected by Brooks probably represents a different, although doubtless nearly related, species.

The taxonomic position of *Ps. siamense* Kerr is clearly indicated by the lengthened internodes, the terminal inflorescence, the halfway united filaments and the large disk, for there is but one other species known so far in which these characters appear. This is *Acranthera tomentosa* R.Br. ex Hook.f., a plant occurring in Assam.

The preceding exposé shows that the genera *Psilobium* Jack and *Acranthera* Arn. ex Meisn. are undoubtedly identical, and as the first dates from 1822, and the latter from 1838, the name *Acranthera* should, according to the priority rule, be rejected in favour of *Psilobium*. This change, however, could hardly be welcomed. In the first place, as neither of the species described by Jack could be rediscovered, there is as yet no type

to which the name *Psilobium* can be attached, and now that the importance of immutable types for the stabilisation of our nomenclature is generally recognized, this will doubtless be felt as a serious drawback. In the second place the change would cause a considerable amount of renaming, for 24 species of *Acranthera* would have to be transferred to *Psilobium*. If, on the other hand, the name *Acranthera* is conserved, but one species, namely *Psilobium siamense* Kerr, has to change its name, for, as stated above, there is very little chance that, for a long time to come, the two species described by Jack will be identified. There is, therefore, in my opinion, sufficient reason for conserving the name *Acranthera*.

In a paper published in 1851 Korthals (in Ned. Kruidk. Arch. 2(2): 183) proposed a new genus *Gonyanera*, which is described as follows:

"Calycis tubus cum ovario connatus, elongatus, subpentagonus; limbus patens, quinquepartitus, partes ovatae acutae. Corollae tubus brevis, limbus 5-partitus, partes aestivatione valvata. Stamina 5, exserta, tubo corollae affixa; filamenta brevia; antherae conniventes, lineares, acutae. Stigma elongato-clavatum; stylus teres, glaber. Ovarium elongatum, angulatum, biloculare. Ovula numerosa, in placentis cylindricis laminae ope dissepimento affixis. Fructus baccatus, bilocularis; semina numerosa, minuta, compressa.

Arbuscula, ramulis teretibus. Folia opposita, longe petiolata, elliptica. Stipulae vaginantes. Flores axillares, bracteati."

In a remark added to the description Korthals declares that his new genus accedes to *Psilobium* in the form of the fruit, but that it differs from the latter in the flower-characters. A comparison of the two generic descriptions, however, fails to bear this out; they agree, in fact, even in minor details. That no mention is made of the genus *Acranthera*, probably finds its explanation in the circumstance that the description of the latter was unknown to him; his paper, namely, although printed in 1851, was written at about the same time at which the latter was published.

Although the description of the flower contains nothing which could stand in the way of an identification of Korthals's genus with *Acranthera*, some doubt might be raised by the description of its habit. It is said to be a small tree provided with terete branches. This is rather inconvenient, for the species of *Acranthera* are all unbranched plants with obtusely quadrangular stems. It is possible, however, that Korthals possessed no field-notes with regard to the habit of the plant, and as several years will have passed between the date of collection (Korthals visited Sumatra, where the plant was collected, in the years 1833–1835) and the date of description, his memory may have deceived him. He may accordingly have mistaken the stem for a branch. It is, of course, not impossible that the latter may have been somewhat more rounded than is usual in this genus, but as his specimens are lost, this supposition can not be verified.

The generic name itself might also offer some difficulty. It would mean (cf. Backer, Verkl. Woordenb. Wet. Plantennamen, Gron. 240. 1937) "pro-

vided with geniculate anthers"; in *Acranthera*, however, the stamens are perfectly straight. To account for this difficulty, I think that the name is misspelt, and that it should be "*Gonianera*": in that case it might be translated as "provided with an angular androecium." As the connective in the Sumatran species of *Acranthera* is strongly keeled, that would be very appropriate.

An entirely different view of the taxonomic position of *Gonyanera* was brought forward by Miquel (in Ann. Mus. Bot. Lugd.-Bat. 4: 262. 1869). He suggested that it might be identical with his own genus *Gardeniopsis* (l.c. 250), but this obviously is a wild shot, for *Gardeniopsis* with its axillary flowers, imbricate aestivation of the corolla-lobes and uni-ovular ovary-cells, clearly belongs to an entirely different circle of affinity. Its position is uncertain; it is even by no means sure that it is a Rubiacea. Miquel says that Blume regarded it as a Rhizophoracea, an opinion which deserves more attention than it has received so far. As our specimens are not provided with flowers, I have not been able to solve this problem.

As the specimens on which the description of *Gonyanera* was based are lost, and as the type-species, *G. glauca* Khs., itself has not been described, there is little hope that the identity of this species will ever be recognized. In the exsertion of the sexual organs it resembles the two species described by Jack and the plant collected by Brooks. In *Acranthera longipes* Merr., the only Sumatran species of which flowers were available to me, I found the sexual organs included.

B. HISTORY OF THE GENUS ACRANTHERA ARN. EX MEISN.

The description of *Acranthera* was sent in January 1838 by Arnott to Meisner, who used it in the compilation of his survey of the Rubiaceae. The latter appeared in the same year in his "Plantarum Vascularum Genera" (1: 162). From a note on the genus *Acranthera* on p. 115 of the second volume, whose successive parts were probably issued simultaneously with the corresponding parts of the first volume, on which they form a running commentary, I infer that the name of the species had already been published as a "nomen nudum" in Wight's "Catalogus." The note reads: "72. (16.) Acranthera. Arnott mss. in litt. d. 30 Jan. 1838. ad nos dat. — Sp. 1: A. Ceylanica, Arn. in Wight cat. n. 2472. — Genus Mussaendae proximum, sed characteribus pluribus et tota facie diversum, ex auct." The number 72 indicates the place assigned to *Acranthera* among the genera belonging to the Rubiaceae; (16.) that among those referred by Meisner to the tribe "Gardeniaceae." The spelling of the specific epithet with a *c* instead of a *z*, as subsequently became customary, deserves our attention, as it evidently has precedence. The remark on the affinity of the new genus with *Mussaenda* L. is noteworthy, because it shows that the idea of a very close relation between these two genera, which up to this moment has never been questioned, originated with Arnott himself. In the following year Arnott's description appeared in the "Annals of Natural

History" (3: 20), and was repeated by Endlicher in his "Genera Plantarum" (p. 1394).

Arnott's description is excellent. Apart from the fact that he mistook the papilliferous upper portion of the style on which the pollen is only temporarily deposited, for the stigma, an error which had also been committed by Jack, and which at that time was comprehensible enough, it contains but a single objectionable statement. This concerns the description of the ovary and fruit. Meisner (Pl. Vasc. Gen. 1: 162) says of the latter that it is "sicut germen pseudo-2-loc., septo medio interrupto utrinque placentam divaricato-2-lamellatam gerente," and the first is described in his own words (in Ann. Nat. Hist. 3: 20. 1839) as "pseudobiloculare, dissepimentis duobus oppositis, vix ad medium attingentibus, placentam bilamellatam divaricatam ferentibus." Beddome (Ic. Pl. Ind. Or. 1: 5. 1874) and Hooker f. (in Benth. et Hook.f., Gen. Pl. 2: 64. 1873 et Fl. Brit. Ind. 3: 92. 1880) accepted this statement as essentially correct, and described the ovary accordingly as unilocular and the placentation as parietal, but Stapf (in Trans. Linn. Soc. Bot. II, 4: 172. 1894) pointed out that both ovary and fruit are perfectly bilocular. They may, however, easily be mistaken for unilocular, because the dissepiment is rather thin in the middle and, therefore, is easily torn when the razor, with which the sections are made, is not sufficiently sharp.

The Ceylonese plant on which the genus was founded, shows, as Arnott already had noticed, a rather remarkable resemblance, especially in habit but also in the aspect of the fruits, to some species belonging to the Cyrtandreae (Gesneriaceae). This applies also to most of the species which since then have been discovered. As a matter of fact, I myself found two of my new ones (*A. Ruttenii* Brem. and *A. megaphylla* Brem.) among the unnamed species of *Cyrtandra* preserved in the Utrecht and Leiden herbaria, and some of those described by Valeton too had provisionally been referred to that genus. The resemblance, nevertheless, is but superficial, and even without looking at the flowers, the two genera are always easily distinguishable, for the leaves of *Acranthera* are never, like those of *Cyrtandra*, dentate, and they are always surrounded by a thin margin covered with stiff hairs; stipules or their cicatrices are always present in *Acranthera* and in *Cyrtandra* as constantly absent; and the fruits of *Acranthera* are always crowned by the persistent calyx, whereas in those of *Cyrtandra* the calyx, of course, is found at the base.

Up to 1872 the genus remained monotypic, but in that year Kurz (in Jour. As. Soc. Bengal, 41(2): 312) referred to it a Tenasserim plant which had been described by Don (Gen. Syst. 3: 491. 1834) under the name *Mussaenda uniflora* Wall. As it differs from the typical representatives of the genus *Mussaenda* L. in its small size and in the absence of the enlarged calyx-lobes, Kurz transferred it to *Acranthera*, which he regarded, on the authority of Arnott, as a nearly related genus. This transfer was doubtless a change for the worse, for the Tenasserim plant has many more characters in common with *Mussaenda* than with *Acranthera*: its stipules,

exactly as in Mussaenda, are deeply bifid, the flowers show the same form of heterostyly combined with dioecism which is found in that genus, the inside of the corolla-tube is not entirely glabrous but in the upper half covered with the same kind of yellow hairs as that of *Mussaenda*, the stamens are not inserted at the base of the corolla-tube but in or somewhat above the middle, the style ends in two filiform stigmas, and the placentas are peltate. The absence of the enlarged calyx-lobes, of course, can not be adduced as an argument in favour of a near affinity with *Acranthera*, as the latter is certainly not the only genus in which none of the calyx-lobes is enlarged, and as its mode of vegetative propagation by means of stolons is never met with in *Acranthera*, there is no appreciable similarity in habit Hooker f. (Fl. Brit. Ind. 3: 86. 1880) referred this species back to *Mussaenda*, but I could show (in Blumea, Suppl. 1: 118. 1937) that it is conspecific with the type-species of *Aphaenandra* Miq., a genus which deserves to be kept up.

Two years after Kurz's abortive attempt to widen the scope of the genus, the generic isolation of the type-species was definitely broken by the description of two new species by Beddome (Ic. Pl. Ind. Or. 1: 5. 1874). Both had been collected in the Western Ghats. At the same time of all three species figures were given (l.c. t. 23–25), but the details of the latter are, unfortunately, of rather doubtful value.

Hooker f. (Fl. Brit. Ind. 3: 92. 1880) brought the number of species to six, but of the three new ones, *A. tomentosa* R.Br. ex Hook.f. alone may be considered congeneric; the two others, *A. Griffithii* Hook.f. and *A. Maingayi* Hook.f., show the same kind of stipules, the same form of heterostyly combined with dioecism, the same covering with yellow hairs in the upper part of the corolla-tube, the same insertion of the stamens midway in the corolla-tube, the same kind of stigmas and the same form of placentation as the Tenasserim plant which Kurz had referred to this genus, but which Hooker himself had excluded: they belong, like the latter, to the circle of affinity of *Mussaenda*. From the typical representatives of that genus they differ in habit, in the complete absence of the enlarged calyx-lobes, and in the large size and brilliant orange or scarlet colour of the corolla. Stapf (l.c. 173) referred them to a subgenus *Asemanthia*, which Ridley (in Kew Bull. 1939: 600. 1939) rightly raised to generic rank. *Acranthera tomentosa* R.Br. ex Hook.f. (*Androtropis tomentosa* R.Br. in Wall., Cat. n. 8398, nomen), on the other hand, is a true representative of the genus, although apparently no near ally of the species found in Ceylon and in the Indian Peninsula, from which it differs conspicuously in the greater length of the internodes, the larger size of the flowers and the halfway united filaments. The flower-colour and details of the structure of the fruit and seeds are still wanting. A near ally was recently discovered in Peninsular Siam: it is the plant described by Kerr under the name *Psilobium siamense* (see above).

The attitude taken up by Baillon (Hist. Pl. 7: 319, 449. 1880) was logically more consistent than that of Hooker, for recognizing that the

genus *Acranthera* in the latter's delimitation contained species which showed a nearer affinity to *Mussaenda* than to those for which the genus originally was created. He transferred the whole group to *Mussaenda*. The other way out of the difficulty, the purging of the genus of the extraneous elements, however, would have deserved preference. As I will show further on, the true representatives of the genus are by no means nearly related to *Mussaenda*.

Hooker l.c. had already mentioned the presence of species of *Acranthera* in Borneo, but as the genus in his delimitation included *Asemanthia* Ridl., and as both genera have since been found in Borneo, it is impossible to say whether the species he had in mind really belonged to *Acranthera*.

Stapf l.c. was the first to describe a Bornean species, and he too mentions the presence of undescribed Bornean species in the collection of the Kew Herbarium. After pointing out that the ovary of *Acranthera* is always bilocular, he proceeds: "Nevertheless, I think, Acranthera must be retained as a well-marked genus after excluding *A. Maingayi* and *A. Griffithii*. It may be characterized by the herbaceous growth, the generally elongated ovary and fruit, the blue or reddish, upwards widened and funnel-shaped or campanulate corolla and the club-shaped, entire style. It is known from Ceylon, the Tinnevelly and Anamally Hills, the Khasia Hills, Cachar and Manipur, and there are several species, still undescribed, in the Kew Herbarium, from Borneo." Although the really important characters, the absence of hairs on the inside of the corolla, the insertion of the stamens at the latter's base, the way in which the anthers enclose the style and in which they are connected with it by means of the tips of their connectives, the way in which the upper part of the style functions as a temporary depository for the pollen, the subulate or semi-conical, often totally cohering stigmata, and the peculiar structure of the testa with its minutely punctate cells, have all been overlooked. The characters as they are given are not all of them general, for the corolla is by no means always blue or reddish, and the style not always club-shaped, the existence of a difference between *Acranthera* and *Mussaenda* is, nevertheless, clearly indicated. Which species Stapf meant when he said that the corolla might be reddish, is difficult to say. It is possible that the colour was described in this way on the label of one or more of the unnamed Bornean species, for instance on that of the plant afterwards described by Valeton under the name *A. involucrata*. At any rate, the flowers of the Ceylon and Peninsular species are blue, and those of *A. tomentosa* will probably, like those of the related *A. siamensis* (Kerr) Brem. n. comb. (*Psilobium siamense* Kerr), prove to be white or nearly white. The corolla of Stapf's own *A. atropella*, a species collected on the slopes of Mt. Kinabalu, has been described as "obscure cyanea." However, as the flowers of the Bornean species, which since then have come to light, are all either white, yellow, orange or red, I suppose that with regard to the flower-colour of *A. atropella* some error has been committed; maybe they assume a dark hue in drying.

In 1910 and 1912 Valeton (in Bot. Jahrb. 44: 550. 1910 et op. cit. 48: 111. 1912) described three more species from Borneo, of which one, *A. axilliflora*, is said to be provided with axillary flowers. Further on I will show that these flowers are in reality uniflorous inflorescences, and that the latter are not really axillary but borne on axillary brachyblasts provided with a pair of rudimentary leaves. All the same this plant represents a type which is quite distinct from that of the other species which up to that time had been recognized as belonging to this genus. In fact, it would probably have been more consistent if Valeton had referred it to *Psilobium*. The *Acranthera* species, which at that time were known, produce their inflorescences at the end of the stem. Later these inflorescences are forced into a lateral position by the development of the bud which forms the continuation of the stem. It is rather remarkable that the same two structural types occur side by side in another genus belonging to the Rubiaceae, namely in *Pomazota* Ridl., where some of the species are provided with sympodial stems and inflorescences which are at first terminal and afterwards solitary at the nodes, whereas in other species the stems are monopodial with the inflorescences opposite at the nodes, while a pair of scale-like leaves at the base of the peduncle prove that they are in reality borne on axillary brachyblasts. As stated above, it is inflorescences of this kind that are found in the Sumatran group of species of *Acranthera* to which, most probably, Jack's *Psilobium nutans* and *Ps. tomentosum* and Korthals's *Gonyanera glauca* too should be referred.

The next year Merrill described a species from the Philippines, which so far has remained the only representative of the genus occurring east of Borneo. *Acranthera philippinensis* Merr. appears to be confined to the western part of Mindanao, i.e. to that part which by means of the Sulu Islands is connected with North Borneo. In this respect it is noteworthy that it differs in minor points only from some of the Bornean species.

At about the same time Valeton described and figured in the "Icones Bogorienses" (4: 181. t. 355, 356. 1913; 4: 275. t. 391–399. 1914) a fairly considerable number of new Bornean species. The last plate figures a species described under the name *A. strigosa*, which differs from the others in the shape of the stipules and in the flower-structure. The stipules are united in a fringed sheath, and the style is longer than the stamens and, if the figure is to be trusted, not provided with an apparatus serving as a temporary depository for the pollen. It seems, therefore, better to exclude this species. The form of the stipules suggests affinity with *Polysolenia* Hook.f., but as neither of Valeton's nor Hooker's species-material was available to me, I am unable to express a definite opinion. *Acranthera multiflora* Val. (l.c. 255, t. 396) is probably identical with *A. frutescens* Val. (in Bot. Jahrb. 44: 551. 1910), at least the descriptions of the two species do not reveal differences of any importance.

In 1934, Merrill described two apparently nearly related species from Sumatra. As no flowers were present, the descriptions are not entirely satisfactory. Of one of them, however, flowers have subsequently been

collected, so that its position could definitely be ascertained. The relations between these plants and Jack's species of *Psilobium* and *Gonyanera glauca* Khs. have already been discussed.

Three years later Merrill (in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937) reverted once more to this genus, describing four new species from Southwest Borneo. One of these proved to be provided with red, another with orange-red flowers.

The preceding notes show that twenty-five of the species which up to now have been referred to *Acranthera*, may confidently be regarded as true representatives of this genus, but as two of them, *A. frutescens* Val. and *A. multiflora* Val., are probably conspecific, only twenty-four are here admitted. To this number should be added the plant described by Kerr under the name *Psilobium siamense*, the species on which the genera *Psilobium* Jack and *Gonyanera* Khs. were based, but which, on account of the insufficiently detailed descriptions, are now unidentifiable, and further the ten species described below.

The specimens which I could study, belong almost all to the following four institutes: the "Rijksherbarium" at Leiden, the University Herbarium at Utrecht, the "Arnold Arboretum" and the "Institut für allgemeine Botanik, Hamburg." As I have seen but a small part of the Buitenzorg material and nothing at all from the collections of the Kew Herbarium and of the Sarawak Museum, my survey does not claim to be exhaustive.

In the descriptive part of this paper special attention has been paid to the species occurring in the Malay Archipelago, all those of which material was available, being fully described. No exception has been made for species of which good descriptions were already extant, because the descriptions in a monograph should, in my opinion, all be made after the same pattern; this is the only way to ensure an easy comparability.

THE TAXONOMIC POSITION OF THE GENUS

In the "Introduction" to this paper I have already pointed out that Arnott's assumption of a very close affinity between *Acranthera* and *Mussaenda* has up to now never been questioned. In Baillon's mind this belief had grown to such a firm conviction that he thought that the two genera might better be united. The common characters on which this assumption rests, are: the pluri-ovular ovary-cells, the valvate aestivation of the corolla-lobes, the fleshy pericarp, the axile placentas, the reddish brown seeds, and the terminal position and, at least partly, cymose structure of the inflorescence.

The bulk of the genera now referred to the tribes Hedyotideae and Mussaendeae are provided with pluri-ovular ovary-cells, show a valvate aestivation of the corolla-lobes, and have axile or nearly axile, peltate or subpeltate placentas and ovoid or angular, yellowish, reddish or brown, more or less distinctly alveolate, striate or punctate seeds. As the distinction between these two tribes rests on the entirely artificial antithesis:

fruits dry or fruits fleshy, I have argued in my paper "On Urophyllum Wall. (Rubiaceae) and its nearest allies" (in Rec. d. trav. bot. Néerl. 38: 171. 1940) that it would be advisable to unite them, under the proviso, however, that those genera in which one or more of the characters enumerated above are missing, should be excluded. As instances of such genera I referred to those provided with a clavate or columnar placenta and smooth seeds. In my recently published (Jour. Arnold Arb. 28: 186–203. 1947) "Monograph of the genus Pomazota Ridl." I give a short survey of the genera which for some reason or other should be excluded. *Acranthera* is not mentioned in this list, because its aberrant character is not so strongly marked as in the others. It is all the same by no means insignificant: its placentas, namely, are not peltate or subpeltate, but attached along their whole length to the dissepiment. It is, therefore, extremely questionable whether this genus may be reckoned to this circle of affinity. If it should be excluded, it can, of course, not be considered a near ally of *Mussaenda*, which is a quite typical representative. The other points of resemblance between *Acranthera* and *Mussaenda*, the fleshy fruits, the terminal position and, at least partially, cymose structure of the inflorescences, do not belong to the general characters of this large tribe, and as they appear in almost all the larger groups, are of little importance. The resemblance between the two genera, therefore, is not sufficiently comprehensive to be regarded as proof of their near affinity.

A survey of the points of difference between the two genera may be expected to throw more light on this question. The principal ones are found in: the structure of the stipules, the floral mechanism, the presence or absence of hairs on the inside of the corolla-tube, the insertion of the stamens, the relation between the latter and the style, the nature of the stigmata, the attachment of the placentas and the structure of the testa. In *Acranthera* the stipules are simple; the flowers homostylous and hermaphrodite; the corolla is completely glabrous inside; the stamens are inserted at the base of the tube; the anthers form a sheath around the style, and are connected by means of the projecting tips of the connectives with the top of the latter; the pollen is temporarily deposited on the upper part of the style, which, to that end, is covered by rows of papillae (for the sake of convenience this part of the style will from now on be designated as the "receptaculum pollinis"): from here it is removed by the visiting insects; the stigmata are subulate or semi-conical, and do not spread, not rarely remaining permanently attached to each other; the placentas, as stated above, are attached along their whole length to the dissepiment, and the testa-cells are minutely but very densely pitted (Fig. 1). In *Mussaenda*, on the other hand, the stipules are always bifid or bipartite; the flowers heterostylous, the short-styled ones being male and the long-styled ones female; the upper part of the corolla-tube is inside covered with yellow hairs; the stamens are inserted at or somewhat above the middle of the tube; there is no connection whatever between the anthers and the style, and the pollen is directly removed from the anthers to the stigmata;

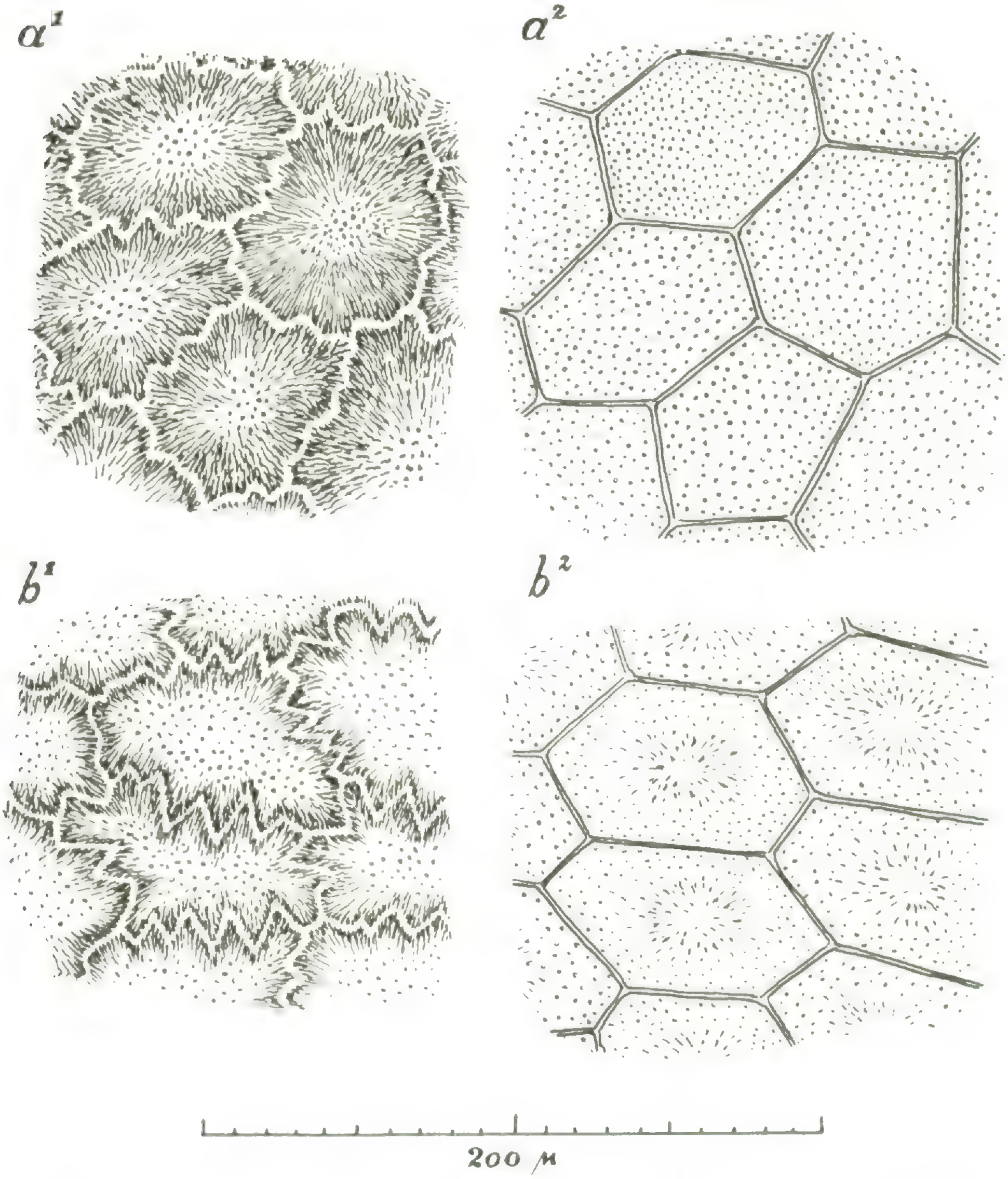

FIG. 1. Testa-cells of *Acranthera longipes* Merr. (a) and *A. siliquosa* Brem. (b). The cells consist almost entirely of the strongly thickened bottom-wall, which in (a) has the shape of a plano-concave, in (b) of a plano-convex lens; (a^1) and (b^1) show the deeper layers, in which the peripheral pit-canals converge towards the centre; (a^2) and (b^2) a surface view of the same cells; in (b^2) the pit-canals in the central boss are seen to diverge a little.

the latter are, at least in the female flowers, always linear and spreading; the placentas are peltate, and the testa-cells provided with a few very large pits (Fig. *2*).

These differences are, of course, not all equally important. The value of the difference in the attachment of the placentas to the dissepiment, has already been discussed; it certainly justifies some doubt with regard to the propriety of leaving the genus *Acranthera* in this tribe. The peculiar

kind of floral mechanism is an even more weighty argument against the view that it should belong to this group, for in none of the general related either to *Hedyotis* L., *Urophyllum* Wall., *Sabicea* Aubl. or *Mussaenda* L., a style functioning as a temporary depository for the pollen is found. As I have pointed out in my "Monograph of the genus Pavetta L." (in Fedde's Repert. 38: 11. 1934) a style of this nature characterizes one of the main

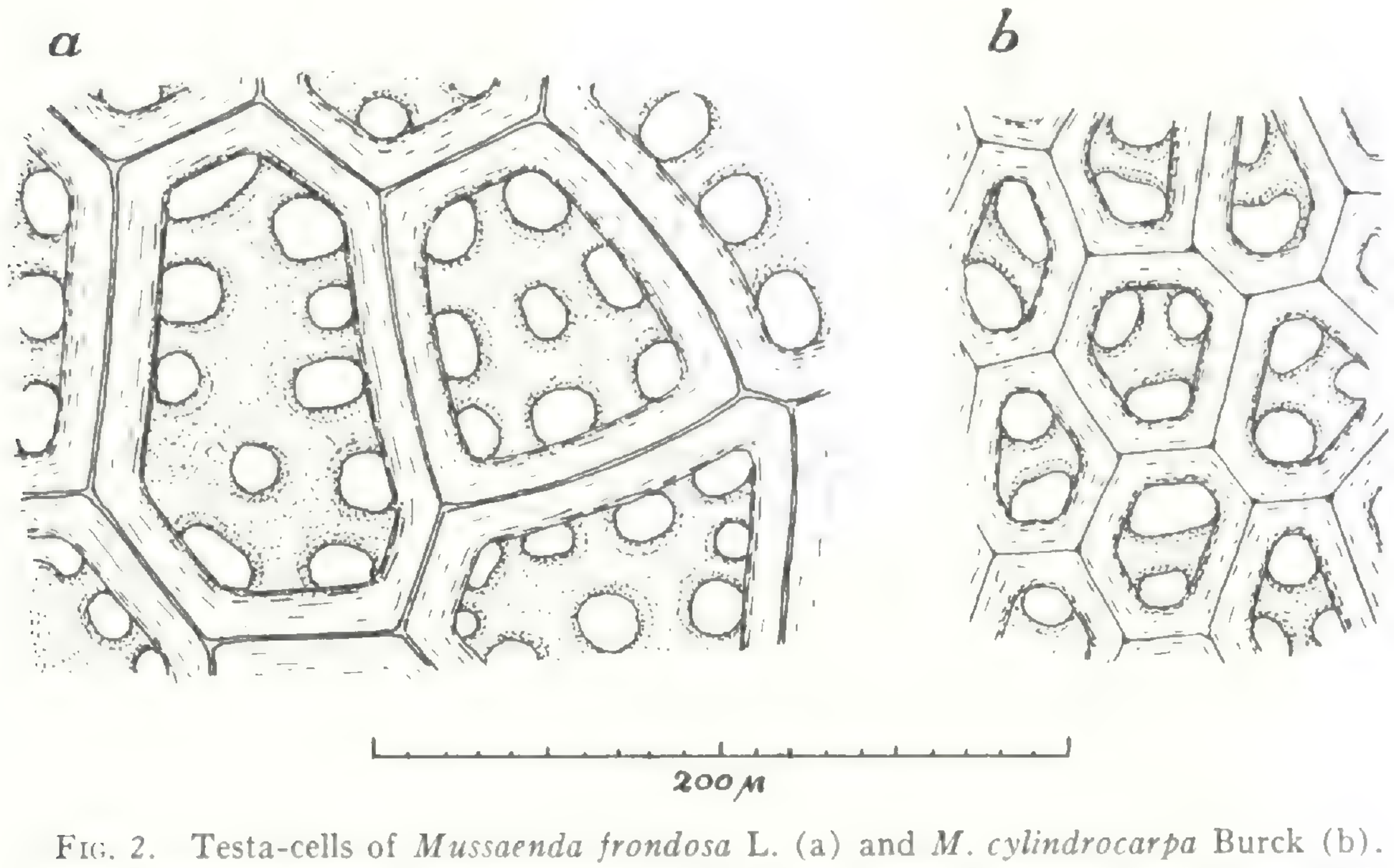

FIG. 2. Testa-cells of *Mussaenda frondosa* L. (a) and *M. cylindrocarpa* Burck (b). The side-walls too are strongly thickened, but pits are confined to the bottom-wall. The size of the cells and the number of pits differ considerably in the two species, but the pits themselves vary but little.

groups of the family, comprising the tribes Ixoreae, Gardenieae, Alberteae, Vanguerieae, the isolated genera *Crossopteryx* Fenzl and *Coptosapelta* Khs., and perhaps part of the present tribe Naucleae. In all these plants, however, the anthers wither after the pollen has been deposited on the style, whereas the *receptaculum pollinis* of *Acranthera* remains included between the empty anthers, and can be reached only through the windows between the projecting tips of the connectives. For this reason, and also because the stamens are not, as in the Ixoreae and their allies, inserted in the corolla-throat, but at the base of the tube, it seems to me that *Acranthera* can not be related to this group either. Moreover, the connection of the stamens by means of the projecting tips of the connectives with the top of the style is a feature so entirely unparalleled in the Rubiaceae, that one might feel inclined to regard the position of the genus with regard to the rest of the family, as similar to that of the Asclepiadaceae with regard to the Apocynaceae, although in this way the importance of the connection between the anthers and the style, is doubtless over-emphasized. It is perhaps more readily comparable to the way in which in the genera *Ceropegia* L. and *Dichaelia* Harv. (Asclepiadaceae) the corolla-tips cohere.

There is one point more on which I should like to expatiate a little, although it does not concern a difference between *Acranthera* and *Mussaenda*, for in the point I mean, the absence of raphide-cells, there is complete agreement between the two genera.

With regard to the presence or absence of raphide-cells there is no conformity between the various groups included in my enlarged tribe Hedyotideae, and as all other large groups are in this respect entirely consistent, this is doubtless a weak point. It might be argued that *Hedyotis* L. and its nearest allies, which are all provided with raphide-cells, are perhaps more closely related to the Spermacoceae and Psychotrieae, which they resemble in the aestivation of the corolla-lobes, but from which they differ in the pluri-ovular ovary-cells, than to *Sabicea* Aubl., *Urophyllum* Wall. and *Mussaenda* L. and their respective allies, which they resemble, apart from the aestivation of the corolla-lobes, to some extent in the nature of the placentation, but in which raphides are apparently always wanting. A satisfactory solution of this question can not yet be given. For the determination of the position to be assigned to *Acranthera*, this is not of paramount importance, as the relations between this genus and the various groups in which raphides are wanting, are hardly more pronounced than those with *Hedyotis*.

THE SUBDIVISION OF THE GENUS

Up to now no attempt has been made to arrange the species of *Acranthera* in natural groups. Valeton, who at one time (in Ic. Bog. 4: fasc. 4. 1914) described no less than nine new species, contented himself with an alphabetical arrangement! This apparently means that he had not been able to distinguish well-defined groups, and was of opinion that the best way to make the species distinguishable, was to figure them, which he accordingly did with as many as he could lay hands on. The result is that of no other rubiaceous genus of any extent has such a large percentage of the species been figured (of the 20 species known in 1914 e.g. no less than 14, i.e. 70 per cent). These efforts, however, were, I am afraid, of little avail, for even with the aid of the pictures the species are by no means easily recognizable. It was to be expected, therefore, that a more thorough analysis would lead to better results. On account of the fact that not all species were available, and also because on some points, for instance on the habit and on the flower-colour, reliable information could not always be obtained, the results are not yet fully satisfactory; but I have no doubt that as soon as more material is forthcoming, the defects of my classification will easily be amended.

It is here perhaps the most suitable place to make a few remarks on the two points just mentioned, the habit and the flower-colour.

A good deal of misapprehension has existed up to now with regard to the habit of these plants. On the labels they are not rarely described as shrubs and in one case even as a small tree (*A. longipes* Merr.), but these

indications should not be taken at their face value. It is a well-known fact that European collectors, accustomed to the soft shoots of the herbs of their native countries, often take tropical herbs for shrubs, even though there is no sign of branching, because they are misled by the woodiness of the stems. The indication "small tree" on the label of some of the specimens of *A. longipes* Merr., on the other hand, is doubtless a faulty translation of the "pohon ketjil" of the Malay collector. It is often overlooked that in Malay each plant provided with an erect stem is called "pohon," no matter whether it is an herb a few centimeters high and without a singe branch or a tree with a large crown.

Stapf was doubtless right when he described the habit of the *Acranthera* species as herbaceous. Among all the specimens investigated by me, but very few were branched, and in these few exceptions the ramification was always of the pseudo-dichotomous kind. They belong to species in which the stems normally are sympodial. This means that occasionally at the base of the inflorescence instead of one bud both buds develop. Even those species which, like *A. frutescens* Val., reach a fairly considerable height (1.5–2 m.), apparently remain unbranched. It is not impossible that the larger plants require more time to complete their life-cycle than those that remain lower, but no reliable information with regard to this point seems to be available. In some species there are indications that the stems in the end sink down, and that innovations are produced from their basal parts.

Our information with regard to the flower-colour too is far from complete. This is all the more unfortunate as it looks as if this might be of real taxonomic importance.

The three western species are blue-flowered. The flower-colour is unknown to me, of the Assam *A. tomentosa* R.Br. ex Hook.f. but in the nearly related *A. siamensis* (Kerr) Brem. the flowers are white. The first of the species described from Borneo, *A. atropella* Stapf, was said to be provided with a dark blue corolla, but, as stated above, this is probably a mistake. The majority of the Bornean species and the only Philippine one possess white or slightly tinted flowers; in the rest of the Bornean species the corolla is yellow, orange or red. In these plants the calyx too is often coloured, not rarely in a different shade. With regard to the flower-colour of the Sumatran species we are insufficiently informed, but those of Brooks's Benkulen species, the one that was identified by Ridley as *Psilobium nutans* Jack, are stated to be greenish white.

The characters with which we will mainly have to be content, are: the shape and size of the stipules, the position and form of the inflorescences, the shape of the corolla-tube, the fusion or complete freedom of the basal parts of the stamens, the presence or absence of a fringe of cilia between the outer rim of the thecae and the connective, the shape of the latter, the presence or absence of a disk, the form of the *receptaculum pollinis*, the structure of the fruit and that of the testa. By the aid of these characters I have divided the genus in nine subgenera, of which the first,

Eu-acranthera, is confined to Ceylon and the Indian Peninsula, the second, *Androtropis*, to Assam and Peninsular Siam, the fourth, *Amphoterosanthus*, to Sumatra, and the others to Borneo, except the eighth, *Mitracme*, which contains, besides some Bornean species, the only representative of the genus found in the Philippines.

Eu-acranthera and *Androtropis* differ from all the other subgenera by the presence of a well-developed disk. In *Eu-acranthera*, moreover, the corolla is blue and its tube begins with a cylindrical part, which widens in the upper half to funnel-shape, whereas in the other subgenera the corolla is presumably never blue, and its tube is either entirely funnel-shaped or, more often, narrowly campanulate. *Androtropis* differs from the other subgenera in the presence of a staminal tube formed by the basal halves of the filaments; in all other subgenera the filaments are entirely free.

The third subgenus, *Cleomocarpus*, differs from the other subgenera in the structure of the fruits, which are narrowly cylindrical and marginate, the hardened margin remaining after the seeds have been shed, in the form of a "replum." The latter, however, is morphologically not equivalent to the replum of the herbaceous Capparidaceae, the Cruciferae and *Chelidonium*, for in these plants the rim is formed by the fused margins of the carpels, whereas in the subgenus *Cleomocarpus* of the genus *Acranthera* it represents the midribs of the carpels. The dissepiment, accordingly, is not, as in the Cruciferae, attached to the rim, but stands at right angles with it; in the end the dissepiment disappears with the valves. The stipules of *Cleomocarpus* are smaller than those found in any other subgenus; in shape, however, they are not unlike those of the subgenera *Eu-acranthera*, *Androtropis* and *Amphoterosanthus*. Its two species are nearly glabrous plants with densely reticulated leaves.

The fourth subgenus, *Amphoterosanthus*, is confined to Sumatra and the neighbouring island Simalur. It resembles the three preceding subgenera in the triangular shape of the stipules, but differs from them in the position of the inflorescences, which are borne on opposite brachyblasts provided with a pair of rudimentary leaves. The inflorescences themselves are few-flowered. In position and structure they are similar to those found in some species belonging to the subgenus *Dichroanthes* and to those of *Ablepharidesma*. The seeds are reticulate, whereas in almost all other species of which ripe fruits were available, the seeds were found to be either distinctly carunculate or nearly smooth. There is, however, no difference of fundamental importance between the various kinds of seed. The two species of *Psilobium*, described by Jack, and *Gonyanera glauca* Khs. belong probably to this subgenus. As no specimens are extant, and as the plants are not identifiable from the descriptions, it did not seem advisable to retain either of these names for the denomination of the subgenus.

In the other subgenera the stipules are wider and longer than in the preceding ones, and of an entirely different shape, namely ovate, elliptic or oblong. The differences between these subgenera are not so striking as

those between the former. They are mainly confined to the position and structure of the inflorescence, the shape of the *receptaculum pollinis* and the presence or absence of a fringe of cilia between the thecae and the connective. *Athroophleps*, however, is well characterized by the peculiar nature of the reticulation. It is noteworthy that with regard to the shape of the *receptaculum pollinis* and to the presence or absence of a fringe of cilia along the connective, the first four subgenera, *Eu-acranthera*. *Androtropis*, *Cleomocarpus* and *Amphoterosanthus*, show a uniform character: their anthers are always eciliolate, and the *receptaculum pollinis* is everywhere fusiform, and of about the same length as the thecae.

In the three subgenera *Phanerochiton*, *Dichroanthes* and *Ablepharidesma* too the *receptaculum pollinis* is of about the same length as the thecae. and either fusiform or cylindrical. In *Phanerochiton* and *Dichroanthes* the anthers are ciliolate, in *Ablepharidesma* eciliolate. The monotypic subgenus *Phanerochiton* differs from the two others in the long, scarious stipules, the trichotomous inflorescence with its large bracts and the thick-walled fruit, and from all other representatives of the genus in the presence of dark-coloured resin-cells on the upper side of the leaves. In *Dichroanthes* the filaments are about as long as the anthers, the *receptaculum pollinis* cylindrical, and the flowers often, perhaps even always. gaily coloured, the corolla yellow, orange or red, and the calyx white or in a different shade of orange or red. In the other Bornean species the filaments are always much shorter than the anthers, and the corolla is apparently everywhere either white or but slightly tinted. *Dichroanthes* is divided in two series, one with terminal inflorescences and cohering stigmata, the other with inflorescences borne on opposite brachyblasts and with free stigmata. In *Ablepharidesma* the inflorescences are few-flowered and borne on opposite brachyblasts, the anthers eciliolate, the shoots thin, and the leaves and stipules small.

In the subgenus *Mitracme* the *receptaculum pollinis* is much shorter than the thecae and mitriform, i.e. the papillae are reclinate and increase from the top towards the base of the receptaculum gradually in length. In this subgenus I distinguish four series. In the first series the anthers are ciliolate, whereas in the other three they are always eciliolate; the species belonging to this series are robust plants with large trichotomous inflorescences provided with large bracts. The second series is monotypic, the only species being the Philippine *A. philippinensis* Merr.; it is a low plant with a trichotomous inflorescence provided with well-developed bracts. The third series is also monotypic, the only species being a narrow-leaved plant with few-flowered inflorescence and small bracts. The fourth series comprises plants with umbelliform inflorescence, in habit not unlike some of the species belonging to the subgenus *Dichroanthes*.

The last subgenus, *Athroophleps*, is a small but very natural group. confined to North Borneo and easily recognizable by the peculiar arrangement of the thick-set prominulous venules, which form narrow meshes,

stretched in a transverse direction. In *A. capitata* Val. this curious arrangement was noticed already by Valeton (cf. Ic. Bog. 4: 276 (line 6), t. 391, fig. 12. 1914). In none of the other subgenera are the meshes stretched in this direction, and except in *Cleomocarpus*, where the reticulation, however, is very faint, their number is always much smaller. Other peculiarities of this subgenus are the annular shape of the *receptaculum pollinis* and the great length of the points in which the connectives are drawn out.

DESCRIPTIO GENERIS*

Acranthera Arn. ex Meisn., Pl. Vasc. Gen. 1: 162, 2: 115. 1838; Arn. in Ann. Nat. Hist. 3: 20. 1839; Endl., Gen. Pl. 1394. 1839; non Kurz in Jour. As. Soc. Bengal II (2): 312. 1872, nam specimen citatum ad Aphaenandram Miq. pertinet; Hook.f. in Benth. & Hook.f., Gen. Pl. 2: 64. 1873; Bedd., Ic. Pl. Ind. Or. 1: 5, t. 23–25. 1874; Hook.f., Fl. Brit. Ind. 3: 92. 1880, *A. Griffithii* Hook.f. et *A. Maingayi* Hook.f. quae ad genus Asemanthiam Ridl. ducendae sunt exclusis; non Hemsl. in Jour. Bot. 25: 204. 1887, nam specimen citatum ad Asemanthiam Maingayi (Hook.f.) Ridl. pertinet, K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. IV. 4: 63. 1891; Trimen, Handb. Fl. Ceylon 2: 324. 1894; Stapf in Trans. Linn. Soc. Bot. II. 4: 173. 1894; Val. in Bot. Jahrb. 41: 550. 1910, 48: 111. 1912; Merr. in Philip. Jour. Sci. Bot. 8: 32. 1913; Val. in Ic. Bog. 4 (3): 181, t. 355, 356. 1913, 4 (4): 275, t. 391–398. 1914, *A. strigosa* Val. p. 391, et t. 399, excl.; Gamble, Fl. Pres. Madras 2: 611. 1921; Lemée, Dict. Pl. Phan. 1: 45. 1929; Merr. in Papers Mich. Acad. Sci. 19: 194. 1934 et in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937.

Mussaenda spec., Baill., Hist. Pl. 7: 319, 449. 1880.

Psilobium Jack, Mal. Misc. 2: 84. 1822 (etiam in Calc. Jour. Nat. Hist. 4: 27. 1843); DC. Prodr. 4: 618. 1830; Roxb., Fl. Ind. ed. Wall. 2: 320. 1832; Miq., Fl. Ind. Bat. 2: 199. 1857, Hook.f. in Benth. & Hook.f., Gen. Pl. 2: 75. 1873; Boerl., Handl. Fl. Ned. Ind. 2: 64. 1891; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. IV. 4: 70. 1891; Lemée, Dict. Pl. Phan. 5: 629. 1934, nomen vix usum et typo perdito haud facile definiendum, igitur melius rejectandum; non Kurz in Jour. As. Soc. Bengal II (2): 313. 1872, nam specimen citatum ad genus Morindopsem Hook.f. pertinet, Ridl. in Kew Bull. 1925: 84. 1925; Kerr in Hook., Ic. Pl. t. 3332. 1937, nomine generico recte usi sunt.

Gouyanea Khs. in Ned. Kruidk. Arch. 2 (2): 183. 1851; Miq., Fl. Ind. Bat. 2: 200. 1857; Hook.f. in Benth. & Hook.f., Gen. Pl. 2: 75. 1873; Boerl., Handl. Fl. Ned. Ind. 2: 64. 1891; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. IV. 4: 70. 1891; Lemée, Dict. Pl. Phan. 3: 316. 1932, nomen typo perdito haud facile definiendum et igitur neglectandum.

Herbae plerumque simplices, rarius pseudo-dichotome ramificatae, subrosulares, ascendentes vel suberectae, basi lignescentes. Caulis plerumque sympodialis, obtuse quadrangularis, internodiis bisulcatis. Folia opposita et aequalia, petiolata; lamina plerumque oblanceolata vel obovata, apice acuminata, margine anguste membranacea ciliata, substrigosa vel strigosa, facie ventrali sub lente albido-granulata, costa nervisque subtus plerumque pilosis, raphidibus et acaridomatiis nullis. Stipulae interpetiolares, simplices, extus haud raro colletris subulatis sparsae, intus glabrae. In-

* The abbreviations for the herbaria of the institutions cited in this paper are as follows: AA=Arnold Arboretum; BD=Bot. Mus., Berlin-Dahlem; BZ=Buitenzorg Botanic Garden; HGB=Inst. Allg. Bot., Hamburg; L=Rijksherbarium, Leiden; U=Bot. Mus., Utrecht.

florescentiae plerumque apice caulis evolutae, casu quo a ramulo axillari mox in positionem lateralem coactae, rarius ramulos abbreviatos (brachyblastos) oppositos, foliis duobus rudimentariis instructos terminantes; flores paniculati, cymosi vel cymoso-umbellati, rarius solitarii, pedicellati vel subsessiles; bracteae variae. Flores hermaphroditi, plerumque 5-, raro 4-meri, aliqui interdum 6-meri. Ovarium plerumque elongatum, rarius turbinatum, biloculare, dissepimento plerumque tenui et faciliter discindente; placentae utroque loculo duae, prope axem orientes et ei parallelae, rarius confluentes, per totam longitudinem dissepimento affixae; ovula numerosissima. Calyx usque ad basin partitus, corollae tubo plerumque subaequilongus; lobi haud raro paulum inaequilati; glandulae interlobulares plerumque conspicuae. Corolla colore variabili, extus plerumque pilosa, intus semper glaberrima; tubus nunc e basi cylindrica infundibuliformis, nunc totus infundibuliformis vel anguste campanulatus; lobi patentes, aestivatione reduplicato-valvata. Stamina basi corollae inserta, tubo plerumque inclusa, rarius breviter exserta; filamenta glabra vel rarius papillosa, plerumque libera, raro usque ad medium connata; antherae lineares, conjuncte stylum includentes, introrsae, thecis facie ventrali contiguis, connectivo faciem dorsalem totam complente, haud raro gibboso vel carinato, margine interdum ciliolato, apice in apiculam vel aristam apici styli incumbentem et cum eo cohaerentem producto. Discus nunc breviter cylindricus vel semi-globosus, nunc inconspicuus. Stylus staminibus aequilongus, parte superiore papillis plerumque 10-seriatim dispositis obtecta pro receptaculo pollinis agente, apice in stigmata subulata vel semi-conica parallela vel confluentes exeuns. Fructus ovoideus, turbinatus vel cylindricus, plerumque baccatus, raro plus minusve capsularis, semper calyce coronatus. Semina parva et numerosissima, rubro-brunnea vel subnigra, paulum compressa, carunculata vel reticulata, testae cellulis semper densissime punctatis, albumine carnoso, embryone recto et parvo.

Distributum speciebus adhuc certe notis 35 in umbra nemorum Ceylaniae, Peninsulae Indicae, Assamiae, Siamiae Peninsularis, Sumatrae, terrae Borneënsis, insulae Filippinae Mindanao dictae.

Species typica: *A. ceylanica* Arn. ex Meisn.

KEY TO THE SUBGENERA

Disk shortly cylindrical or semi-globose. Inflorescences always at the end of the stem. — Species from Ceylon, the Western Ghats, Assam and Peninsular Siam.

Corolla blue; basal part of the tube cylindrical, upper part infundibuliform. Filaments free. — Species from Ceylon and the Western Ghats...A. *Eu acranthera*

Corolla (always?) greenish; tube entirely infundibuliform. Filaments in the lower half connate. — Species from Assam and Peninsular Siam...B. *Androtropis*

Disk inconspicuous. Inflorescences either at the end of the stem or borne on opposite brachyblasts provided with two rudimentary leaves. — Species from the Malay Archipelago (Sumatra, Borneo, Mindanao).

Stipules triangular, at the most 1.5 cm. long, usually much shorter.

Stipules not more than 3 mm. long. Inflorescences at the end of the stem. Fruits bicostate; the ribs after the shedding of the seeds remaining behind in the form of a replum. Seeds carunculate. — Bornean species.....C. *Cleomocarpus*

Stipules 7–15 mm. long. Inflorescences at the end of opposite brachyblasts provided with rudimentary leaves, few-flowered. Fruits 5- or 6-costate. Seeds reticulate. — Species from Sumatra and Simalur...D. *Amphoterosanthus*

Stipules ovate, elliptic or oblong, usually more than 1.5 cm. long, if somewhat shorter (e.g. subgenus *Ablepharidesma*), then at least with the greatest width near the middle and several times longer than the diameter of the stem.

Receptaculum pollinis as long as or but slightly shorter than the thecae, and either cylindrical or fusiform.

Connective ciliolate.

Leaves on the upper side dotted with dark-coloured resin-cells. Inflorescences either trichotomous with fairly long primary branchlets or, by the suppression of the lateral branchlets, long-pedunculate. Bracts large. Corolla reddish. — A single Bornean species.....E. *Phanerochiton*

Inflorescences either umbelliform or reduced to a single flower, always subsessile. Bracts small. Corolla yellow, orange or red. — Bornean species.....F. *Dichroanthes*

Connective eciliolate. Inflorescences borne on opposite brachyblasts provided with rudimentary leaves, few-flowered. Corolla white. — Bornean species.....G. *Ablepharidesma*

Receptaculum pollinis much shorter than the thecae, either mitriform or annular. Inflorescences always at the end of the stem.

Reticulation lax; the smaller venules not or but slightly prominent. *Receptaculum pollinis* mitriform. — Species from Borneo and Mindanao.....H. *Mitracme*

Meshes of the reticulation small and stretched in a transverse direction; the venules themselves prominulous. *Receptaculum pollinis* annular. — Confined to North Borneo.....I. *Athroophleps*

SUBGENUS A. EU-ACRANTHERA BREM. SUBGEN. NOV.

Herbae humiles, caule petiolisque pilosis. Folia laxe reticulata. Stipulae ovato-triangulares, internodiis breviores. Inflorescentia terminalis, trichotome corymbosa. Corolla coerulea vel violacea, tubo e basi cylindrica infundibuliformi, quam calyce multo longiore. Stamina filamentis papillosis, liberis, quam antheris longioribus, antheris eciliolatis. Discus breviter cylindricus. Receptaculum pollinis fusiforme. Fructus ovoideus. Semina carunculata.

Species tres, Ceylaniam et Peninsulam Indicam habitantes, ubi in altitudine 900–1500 m. crescunt. Subgeneris typus: *A. ceylanica* Arn. ex Meisn.

KEY TO THE SPECIES

Calyx-lobes obovate, spreading; anthers shortly apiculate. — Indian Peninsula.....1. *A. anamallica*

Calyx-lobes linear-lanceolate or narrowly triangular, erect; anthers aristate.

Leaves subglabrous on the upper side; calyx lobes linear lanceolate; corolla tube 4 cm. long. — Indian Peninsula.....2. *A. grandiflora*

Leaves distinctly hairy on the upper side; calyx lobes narrowly triangular; corolla tube 2 cm. long. — Ceylon.....3. *A. ceylanica*

1. **Acranthera anamallica** Bedd., Ic. Pl. Ind. Or. 1: 5, t. 23. 1874; Hook.f., Fl. Brit. Ind. 3: 93. 1880; Gamble, Fl. Pres. Madras 2: 611. 1921. — Indian Peninsula (Western Ghats).

2. **Acranthera grandiflora** Bedd., Ic. Pl. Ind. Or. 1: 5, t. 25. 1874; Hook.f., Fl. Brit. Ind. 3: 93. 1880; Gamble, Fl. Pres. Madras 2: 611. 1921. — Indian Peninsula (Western Ghats).

3. Acranthera ceylanica Arn. ex Meisn., Pl. Vasc. Gen. 2: 115. 1838. *Acranthera zeylanica* Arn. in Ann. Nat. Hist. 3: 21. 1839; Walpers, Repert. 6: 77. 1846; Thwaites, Enum. Pl. Zeyl. 138. 1860; Bedd., Ic. Pl. Ind. Or. 1: 5, t. 24. 1874; Hook.f., Fl. Brit. Ind. 3: 92. 1880; Trimen, Handb. Fl. of Ceylon 2: 324. 1894. — Ceylon.

As no material of *A. anamallica* and of *A. grandiflora* was available to me, the key was based on data gathered from the literature.

SUBGENUS B. ANDROTROPIS (R.Br. in Wall. Cat. n. 8398, gen. inedit.)

Herbae altiores. Folia laxe reticulata. Stipulae ovato-triangulares, internodiis multo breviores. Inflorescentia terminalis, corymbosa. Corolla ubi color notus viridula, tubo infundibuliformi, quam calyce longiore. Stamina filamentis glabris, usque ad medium connatis, quam antheris longioribus, antheris eciliolatis. Discus breviter cylindricus vel semiglobosus. Receptaculum pollinis fusiforme. Fructus cylindricus, 5-costatus. Semina carunculata.

Species duae, Assamiam et Siamiam Peninsularem habitantes. Subgeneris typus: *A. tomentosa* R.Br. ex Hook.f.

KEY TO THE SPECIES

Leaves strigose on the upper side. Corolla more than 3 cm. long. — Assam.....4. *A. tomentosa*

Leaves glabrous on the upper side or near the margin and towards the base strigose. Corolla about 2 cm. long. — Peninsular Siam.....5. *A. siamensis*

4. **Acranthera tomentosa** R.Br. ex Hook.f., Fl. Brit. Ind. 3: 92. 1880 (*Androtropis tomentosa* R.Br. in Wall. Cat. n. 8398, nomen). — Assam.

5. **Acranthera siamensis** (Kerr) Brem. n. comb. *Psilobium siamense* Kerr in Hook., Ic. Pl. t. 3332, 1937. — Peninsular Siam.

Of *A. tomentosa* I had but a single, not very good, specimen, whose flowers were much larger than those of the specimens described by Hooker. Fruits of this species were not available to me.

For *A. siamensis* I relied on the detailed description given by Kerr and on the excellent plate by which the latter is accompanied. Kerr referred this species to *Psilobium* Jack, because it resembles the specimen collected by Brooks in Benkulen, which Ridley (in Kew Bull. 1925: 84. 1925) had identified as *Ps. nutans* Jack, but which is probably a different species (see above). The near affinity between the Siamese plant and *A. tomentosa* R.Br. ex Hook.f. was overlooked by the author.

Kerr ends his description with the following remark: "It seems probable, judging from a cursory examination, that some plants assigned to *Gardenia*, Section *Gardeniella*, should rather be referred to *Psilobium*."

The section *Gardeniella* was created by Ridley (Fl. Mal. Pen. 2: 80. 1923), who referred to it four species from the Malay Peninsula, which show but little resemblance to the typical representatives of the genus *Gardenia*. The possibility that they might belong to *Acranthera*, of which representatives are found both to the North and to the South of the Malay Peninsula, certainly deserves our attention. Judging from the somewhat

meagre descriptions, I do not believe however that anyone of them can be transferred to this genus. The first, *G. tentaculata* Hook.f. is described by Ridley as a "bush," a habit which is entirely unknown in *Acranthera;* its stipules, apparently, are similar to those of *A. strigosa* Val., a species which in my opinion does not belong to this genus. The three other ones seem to be unbranched, but they differ from all species of *Acranthera* known so far in the position of the inflorescences: the latter, namely, are found on the defoliated part of the stem. In two of them, *G. virescens* Ridl. and *G. pulchella* Ridl., the stipules, moreover, are like those of *G. tentaculata* "fringed with long points." The last one, *G. didymocarpus* Ridl., had provisionally been referred by H. H. W. Pearson to *Acranthera.* Its removal by Ridley to *Gardenia* evidently means that it does not fit the description of *Acranthera.* It is possible, however, that Ridley was influenced by the lateral position of the inflorescences.

Subgenus C. CLEOMOCARPUS Brem. subgen. nov.

Herbae ascendentes vel suberectae, subglabrae. Folia dense sed vix conspicue reticulata. Stipulae breviter et late triangulares, in cupulam brevem connatae, apiculatae, usque ad 3 mm. altae, persistentes. Inflorescentia terminalis. Corolla alba, extus glabra, tubo campanulato. Stamina filamentis glabris et liberis, quam antheris multo brevioribus, antheris connectivo carinato, eciliolato. Discus inconspicuus. Receptaculum pollinis fusiforme. Fructus cylindricus, bicostatus, glaber, costis maturitate repli instar remanentibus. Semina carunculata.

Species duae terrae Borneënsis partes septentrionalem et orientalem habitantes. Subgeneris typus: *A. siliquosa* Brem. n. spec. v. infra.

KEY TO THE SPECIES

Leaves with 10–12 pairs of nerves. Inflorescence laxly paniculate, many-flowered. — East Borneo.....6. *A. siliquosa*
Leaves with 6–8 pairs of nerves. Inflorescence cymose, 2- to 7-flowered. — North Borneo.....7. *A. ophiorrhizoides*

6. **Acranthera siliquosa** Brem. n. spec.; typus: *Endert 3368* (BZ).

Herba suberecta, usque ad 2.5 m. alta. Caulis sympodialis, diametro ad apicem 2 mm. basin versus usque ad 5 mm. aucto, glaberrimus, sicc. fuscescens, internodiis 2–7.5 cm. longis. Folia petiolo 2–6 cm. longo, glaberrimo instructa; lamina oblonga vel obovata, 12–24 cm. longa et 5–8.5 cm. lata, apice caudato-acuminata, basi cuneata vel contracta, margine pilis brevibus sparse et vix conspicue strigosa, ceterum glaberrima, membranacea, utrimque opaca, sicc. supra saturate olivacea, subtus dilute olivacea vel olivaceo-brunnea, nervis plerumque saturate olivaceo-brunneis distincte notata, nervis utroque latere costae 10–12. Stipulae apiculo incluso 3 mm. altae, costa et basi incrassatae, totae glabrae. Inflorescentia breviter pedunculata, laxe paniculiformis, glabra; pedunculus 5–15 mm. longus; rachis 7–12 cm. longa; ramuli ultimi monochasiales, post anthesin maxime 1 cm. longi et cicatricibus maxime 5 notati; bracteae ramulorum primariorum subulatae, 5 mm. longae, aliae minores, ultimae vix 1 mm. longae, omnes subpersistentes. Flores subsessiles; pedicelli post anthesin

tamen usque ad 5 mm. elongantes. Ovarium cylindricum, circ. 10 mm. longum et vix 0.5 mm. diam., glabrum. Calycis lobi lineares, 7 mm. longi et 0.5 mm. lati, acuti, glabri. Corollae tubus 10 mm. longus et 4 mm. diam.; lobi 2.5 mm. longi latique, mucronati. Stamina 6.5 mm. longa; filamenta 1 mm.; antherae 5.5 mm. longae, connectivo in appendicem rectam 0.5 mm. longam exeunte. Stylus in stigmata subulata, 0.7 mm. longa exeuns. Fructus 4 cm. longus et 1.5 mm. diam., viridis.

Habitat terrae Borneënsis partem orientalem.

BORNEO: Eastern and Southern Division. West Kutai: Liak Petak, alt. 450 m., *Endert 3368* (BZ, typus); ibidem, Liak Leng, alt. 250 m., *id. 2998* (BZ, co-typus fructifer).

7. **Acranthera ophiorrhizoides** Val. in Ic. Bog. 4: 287, t. 397. 1914. — North Borneo.

I am not fully certain that this species, of which no material was available, really belongs to *Cleomocarpus*. It resembles *A. siliquosa* in the nature of the stipules, the nearly glabrous leaves, the terminal inflorescence and the small size and white colour of the flowers. The fruits are imperfectly known; in Valeton's specimens they were apparently immature, and with regard to the presence or absence of a replum there is, therefore, no certainty. The anthers have been described as bearded, and figured as ciliolate, but I suppose they are neither. Valeton's specimens were apparently badly preserved, and it is, therefore, quite possible that the presence of cilia was simulated by the mycelium of a fungus with which the anthers were overgrown.

SUBGENUS D. AMPHOTEROSANTHUS BREM. SUBGEN. NOV.

Herbae altiores. Folia supra glaberrima, laxe reticulata. Stipulae triangulares, in cupulam brevem connatae, apice appendiculatae, internodiis multo breviores, persistentes. Inflorescentiae brachyblastos oppositos, foliis rudimentariis instructos terminantes, pauciflorae. Calycis lobi lanceolati vel ovati. Corolla in specie sola ubi color notus est viridula; tubus campanulatus. Stamina filamentis glabris et liberis, quam antheris brevioribus, antheris ecilolatis, connectivo carinato instructis. Discus inconspicuus. Receptaculum pollinis fusiforme. Fructus cylindricus, 5- vel 6-costatus. Semina reticulata.

Species adhuc certe notae tres Sumatram et insulas ad occasum habitantes. Subgeneris typus: *A. longipes* Merr.

As the two *Psilobium* species of Jack and Korthals's *Gonyanera glauca* are provided with "axillary" inflorescences or flowers and elongated ovaries and fruits, there can be little doubt that they belong to this subgenus. The exserted sexual organs distinguish them from *A. longipes* Merr., the only species of which flowers were available. The description of *Psilobium nutans* Jack says that the leaves are lanceolate and smooth, and that the peduncles bear three to six flowers, whereas in *Ps. tomentosum* Jack the inflorescences are apparently uniflorous and the leaves tomentose. The leaves of *Gonyanera glauca* Khs. are said to be elliptic and the calyx-lobes ovate, and the inflorescences of this species too appear to be uniflorous. That these meagre indications would suffice for the identification of these species, seems excluded.

KEY TO THE SPECIES

Shoots, petioles and fruits glabrous. Petioles 4.5–9 cm.; lamina 25–32 cm. long. — East Sumatra.....8. *A. longipes*

Shoots, petioles and fruits strigose. Petioles not more than 3 cm.; lamina not more than 20 cm. long.

Stipules 10–15 mm. long. Calyx-lobes ovate-oblong, 6 × 4 mm. — East Sumatra. .....9. *A. Yatesii*

Stipules 7–10 mm. long. Calyx-lobes linear-lanceolate, 12 × 2.5 mm. — Siamalur. .....10. *A. simalurensis*

8. **Acranthera longipes** Merr. in Papers Mich. Acad. Sci. 19: 193. 1934; non Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937, homon. illeg. (cf. *A. longipetiolata* Merr. ex Brem. n. nom.).

Herba robusta sed altitudine ignota. Caulis mox totus glaber, diametro ad apicem 2.5 mm., basin versus usque ad 8 mm. aucto, internodiis 1–2.5 cm. longis. Folia petiolo 4.5–9 cm. longo, glabro instructa; lamina oblanceolata, 25–32 cm. longa et 7.5–10 cm. lata, apice breviter vel longius acuminata, basi acuta vel cuneata, margine pilis brevibus vix conspicue strigosa, subtus primum costa nervisque densius, inter nervos sparse, deinde costa nervisque sparse strigosa, utrimque opaca, sicc. supra olivaceo-brunnea, subtus fusca, nervis utroque latere costae plerumque 11. Stipulae 5–7 mm. longae et 6–7 mm. latae, apice colletris pluribus et infra apicem fasciculo pilorum instructae. Inflorescentiae basi foliis rudimentariis 2.5 mm. longis instructae, 3-florae; bracteae florum lateralium lanceolatae, 5 mm. longae. Flores pedicello strigoso, 2.5 mm. longo elati. Ovarium cylindricum, 10 mm. longum et 1 mm. diam., strigosum. Calycis lobi oblanceolati, 7.5 mm. longi et 1.8 mm. lati, acuti, utrimque glabri, 7-nervii. Corolla colore ignoto, 14.5 mm. longa; extus glabra; tubus 12 mm. longus et 7 mm. diam.; lobi late ovati, 5 mm. lati et 2.5 mm. longi. Stamina 8.5 mm. longa; filamenta 2 mm.; antherae 6.5 mm. longae, connectivo in apiculam brevem producto. Receptaculum pollinis 5.5 mm. longum, apice acuto bifido. Fructus 4–4.5 cm. longus et 3 mm. diam., glaber, pericarpio tenui.

Habitat Sumatram Orientalem.

SUMATRA: East Coast Gouvt: Asahan, Merbau, Bila, near Bila Pertama (Perbarian), *Rahmat 3.5* (AA, dupl. typi fructiferi); ibidem, near Lumban Ria, *id. 7431* (AA); ibidem, near H. Bagasan, *id. 6832* (AA), *7231* (AA, co-typus meus florifer).

Vernacular names: kaju lambok, kaju si martumbus.

9. **Acranthera Yatesii** Merr. in Papers Mich. Acad. Sci. 19: 193. 1934. — East Sumatra.

This species, which I could not investigate myself, differs from *A. longipes* in the much shorter petioles, the smaller size of the leaves and their more conspicuously pilose underside, in the up to 1.5 cm. long stipules, the ovate-oblong calyx-lobes and the hairy fruits. From *A. simalurensis* it differs in the larger size of the stipules and in the shorter and wider calyx-lobes. It was collected in the same region as *A. longipes*, namely in the East Coast Gouvernment (District Pematang Siantar, Dk Tinggi Radja, alt. 500 m., *Yates 2153*). The flowers are still unknown.

10. **Acranthera simalurensis** Brem. n. spec.; typus: *Achmad 141* (L).

Herba robusta sed altitudine ignota. Caulis pilis ferrugineis primum dense, deinde sparse hirsuto-strigosus, diametro ad apicem 2.5 mm., basin versus usque ad 8 mm. aucto, internodiis 1.2–5.5 cm. longis. Folia petiolo 1.5–3 cm. longo, dense hirsuto-strigoso instructa; lamina lanceolata vel oblanceolata, 11–18 cm. longa et 4–7.5 cm. lata, breviter vel longius acuminata, basi acuta vel cuneata, margine pilis brevibus strigosa, subtus costa nervisque pilis stramineis dense, inter nervos sparse strigosa, utrimque opaca, sicc. supra olivaceo-brunnea vel nigrescens, subtus fusca, nervis utroque latere costae 10 vel 11. Stipulae 7–10 mm. longae et 5–7 mm. latae, apice colletris pluribus instructae, costa praesertim apicem versus hirsuto-strigosa. Inflorescentiae basi foliis rudimentariis 3 mm. longis instructae, 1- usque ad 3-florae; bracteae florum lateralium lanceolatae, 5 mm. longae. Flores nondum visi. Fructus pedicello strigoso, 5 mm. longo elatus, 3 cm. longus et 2.5 mm. diam., strigosus, calycis lobis linearilanceolatis, 12 mm. longis et 2.5 mm. latis, acutis coronatus, pericarpio tenui.

Habitat insulam a Sumatra ad occasum Simalur dictam.

SIMALUR: s.l., *Achmad 141* (L, typus).

Vernacular name: gulamang gadjah.

Valeton had recognized in Achmad's specimen a new *Acranthera* species, for which he proposed the specific epithet "*mutica*," but a description was never published. The name "*mutica*" has probably been used in opposition to "*Acranthera*," and would mean that the anthers are blunt, but as this can hardly be right, I have chosen another epithet. If the name really referred to the shape of the anthers, it would prove that Valeton had seen flowers, which in the Leiden specimens were not present; the Buitenzorg material, therefore, would be more complete.

SUBGENUS E. PHANEROCHITON BREM. SUBGEN. NOV.

Herba robusta, suberecta. Folia supra cellulis resiniferis sicc. sub lente nigro-punctata, laxe reticulata. Stipulae oblongae, apice acuto longe apiculatae, maximae, extus bis inde colletris instructae, laxe reticulatae. Inflorescentia terminalis, nunc trichotome corymbosa et subsessilis, nunc ramulis lateralibus suppressis longius pedunculata; ramuli ulteriores bracteis magnis imbricatis instructi. Corolla rubella, tubo infundibuliformi. Stamina filamentis quam antheris multo brevioribus, antheris connectivo carinato, granulato et ciliolato. Discus inconspicuus. Receptaculum pollinis thecis paulo brevius, fusiforme. Fructus ovoideus, pericarpio et dissepimento crassis. Semina reticulata.

Subgenus adhuc monotypicum terrae Borneënsis partem occidentalem habitans. Subgeneris typus: *A. involucrata* Val.

11. **Acranthera involucrata** Val. in Ic. Bog. 4: 279, t. 393. 1914.

Herba robusta sed altitudine ignota. Caulis dense velutino-hirsutus, diametro 6–9 mm., internodiis 1.5–5 cm. longis, inferioribus tamen non visis. Folia petiolo 2–4 cm. longo, dense velutino-hirsuto instructa; lamina obovata, 12.5–35 cm. longa et 5.2–12 cm. lata, apice caudato-acuminata,

basi sensim in petiolum contracta, margine primum dense, deinde sparsius velutino-hirsuta, supra costa per totam longitudinem velutino-hirsuta excepta glaberrima, subtus costa nervisque densissime velutino-hirsuta, venulis sparsius velutinis, inter venulos primum dense, deinde sparse villosa, supra nitidula, sicc. supra saturate rubro-brunnea, subtus fusca, nervis utroque latere costae 12–20. Stipulae usque ad 6.5 cm. longae et 1.7 cm. latae, basi circ. 1 cm. connatae, extus costa prominente sicut margine dense velutino-hirsutae, ceterum sparse villosae, scariosae, sicc. brunneae, persistentes. Inflorescentiae ramuli primarii et rachis aut, si ramuli suppressi, pseudo-pedunculus 3–5 cm. longi, dense velutino-hirsuti; ramuli alii breves et flores igitur sub bracteis magnis latentes; bracteae ramulorum primariorum deciduae, nondum visae, ramulorum secundariorum ovatae, 3.5 cm. longae et 2.5 cm. latae, aliae gradatim minores et praesertim angustiores, dense imbricatae, minime usque ad anthesin persistentes; omnes ubique sed praesertim margine et costa pubescentes. Flores pedicellati. Pedicellus 5 mm. longus, dense velutinus. Ovarium breviter cylindricum, 6 mm. longum et 2 mm. diam., dense velutinum. Calycis lobi oblanceolati, 10 mm. longi et 3.5–4 mm. lati, acuti, extus intusque sparse, margine et costa densius pubescentes. Corolla (forsitan nondum plene matura) 11 mm. longa, extus sparse, margine densius villosa; tubus 6 mm. longus et ad orem 7 mm. diam.; lobi ovati, 5 mm. longi et basi 4.5 mm. lati, acuti. Stamina 8.5 mm. longa; filamenta 1.5 mm.; antherae 7 mm. longae, connectivo in appendicem vix 0.5 mm. longam producto. Stylus apice conica vix divisus. Fructus circ. 10 mm. diam.

Habitat terrae Borneënsis partem occidentalem.

SARAWAK: near Kuching, *Haviland & Hose*, 8. IX. 1892 (AA); *Haviland*, 15. IX. 1892; s.l., *nat. coll. 2018* (AA). BORNEO: Western Division: Upper Kapuas Mts., base of G. Damus, *Hallier 486* (L).

This species is, apart from the much denser indumentum and the persistent bracts, habitually not unlike *A. frutescens* Val., from which it differs, however, in the following important points: the presence of resin-cells in the epidermis of the upper side of the leaf, the infundibuliform corolla-tube, the greater length and fusiform shape of the *receptaculum pollinis*, and the thick-walled fruit. The thick dissepiment distinguishes this plant from all other species of this genus of which the fruits are known. The wide range of variability in the number of nerve pairs is rather remarkable: it may be observed even in one and the same specimen.

SUBGENUS F. DICHROANTHES BREM. SUBGEN. NOV.

Herbae humiles, ascendentes vel subrosulares. Folia laxe reticulata. Stipulae oblongae, lanceolato-oblongae, ellipticae vel ovatae, internodiis longiores, extus hic inde colletris sparsae, laxe reticulatae. Inflorescentiae nunc terminales, nunc brachyblastos oppositos, basi foliis rudimentariis instructos terminantes, umbelliformes vel ad florem singulum redactae. Calycis lobi interdum colorati. Corolla, ubi color notus, rubra, aurantiaca vel lutea, tubo infundibuliformi vel anguste campanulato. Stamina filamentis glabris et liberis, quam antherae nunc paulo brevioribus, nunc paulo longioribus, antheris connectivo nunc carinato, nunc convexo, sed semper minime basi ciliolato, in appendicem brevem producto. Discus

inconspicuus. *Receptaculum pollinis* thecis paulo brevius, vix incrassatum. Fructus adhuc imperfecte notus, probabiliter cylindricus, 6-costatus.

Species adhuc notae duodecim terram Borneënsem habitantes. Subgeneris typus: *A. salmonea* Brem. n. spec. v. infra.

KEY TO THE SPECIES

Inflorescence at the end of the stem. Stigmata cohering.....Series a. **Sympodiales**
Calyx-lobes 17–18 mm. long. Corolla tube infundibuliform. Connective carinate and granulate.
Leaves bullate and provided with 13–15 pairs of nerves. Inflorescence with several flowers. Calyx and corolla both red. — West. Borneo.....12. *A. bullata*
Leaves without blisters and provided with 6–8 pairs of nerves only. Inflorescence with 1 or 2 flowers only.
Leaves mostly less than 13 cm. long and 5 cm. wide, entirely glabrous above. Bracts 7 mm. long. Pedicel up to 10 mm. long. — West Borneo.....13. *A. Johannis-Winkleri*
Leaves mostly more than 13 cm. long and 5 cm. wide; midrib on the upper side strigose. Bracts 2–3 mm. long. Pedicel more than 2 cm. long. — North ? Borneo.....14. *A. monantha*
Calyx-lobes 10–12 mm. long. Corolla-tube narrowly campanulate. Connective neither carinate nor granulate.
Leaves variegated, entirely glabrous on the upper side. Inflorescence with 6–12 flowers. Corolla sulphur-yellow. Anthers 6.5 mm. long. — West Borneo.....15. *A. variegata*
Leaves entirely green, with a few long appressed hairs on the upper side. Inflorescence with 4–6 flowers. Corolla orange. Anthers 11 mm. long. — West Borneo.....16. *A. aurantiaca*
Inflorescences at the end of opposite brachyblasts provided with a pair of rudimentary leaves. Stigmata free.....Series b. **Monopodiales**
Inflorescence umbelliform.
Leaves less than 20 cm. long and provided with 5–8 pairs of nerves. Calyx-lobes 12 mm. long. — East Borneo.....17. *A. salmonea*
Leaves about 30 cm. long and provided with 13 pairs of nerves. Calyx-lobes 20 mm. long. — Borneo.....18. *A. megaphylla*
Inflorescence usually reduced to a single flower.
Leaves with about 10 pairs of nerves. Stipules more than 3 cm. long. — West Borneo.....19. *A. longipetiolata*
Leaves with less than 10 pairs of nerves. Stipules less than 2.5 cm. long.
Calyx-lobes ovate-lanceolate.
Midrib and nerves on the underside densely white-pubescent. — South-east Borneo.....20. *A. axilliflora*
Midrib and nerves on the underside densely ferrugineous-pubescent. — West Borneo.....21. *A. abbreviata*
Calyx-lobes linear-lanceolate or narrowly triangular.
Leaves entirely green, provided with about 8 pairs of nerves. Stipules 5–12 mm. long. Corolla 2–2.5 cm. long. — Central Borneo.....22. *A. hirtistipula*
Leaves variegated, provided with 4–5 pairs of nerves. Stipules 12–20 mm. long. Corolla 3–4.5 cm. long. — Central Borneo.....23. *A. maculata*

Series A. SYMPODIALES

Inflorescentiae caulem terminantes. Stigmata cohaerentia. — Species 12–16.

12. **Acranthera bullata** Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937.

Herba ascendens, circ. 12 cm. alta, interdum pseudo-dichotome ramificata. Caulis primum pilis curvis breviter et parce substrigosus, deinde glabrescens, diametro ad apicem 5 mm., basin versus usque ad 7 mm. aucto, internodiis raro plus quam 1 cm. longis. Folia petiolo 1–4 cm. longo, pilis curvis breviter fulvo-strigoso instructa; lamina obovata, 11–18 cm. longa et 6–9 cm. lata, apice breviter acuminata, basi plerumque subtruncata sed prope petiolum subito contracta, interdum tamen acuta, margine pilis pro parte longioribus primum albidis, deinde fulvis, primum dense, deinde sparsius substrigosa, supra glaberrima, subtus costa nervis venulis pilis brevibus curvis fulvis dense substrigosa, utrimque opaca, supra vivo olivacea, sicc. olivaceo-brunnea, subtus vivo laete rubra, sicc. fuscescens, inter venulos principales conspicue bullata, nervis utroque latere costae 13–15, venulis principalibus nervos transverse connectentibus, remotioribus, aliis paucis et vix conspicuis. Stipulae ellipticae, 1.5–2.5 cm. longae et 1.2–2 cm. latae, acutae vel subacutae, sed costa semper in mucronem satis longam producta, extus sparse et breviter strigosae, costa prominente, subpatentes, persistentes. Inflorescentia subsessilis, umbelliformis, multiflora; bracteae lineares, 6 mm. longae et 0.7 mm. latae, margine densius, alibi pilis brevibus parce strigosae. Flores pedicello pilis brevissimis dense griseo-strigoso, usque ad 10 mm. longo instructi. Ovarium cylindricum, 10 mm. longum et 0.8 mm. diam., ut pedicellus dense griseo-strigosum. Calycis lobi rubri, lanceolati, 18 mm. longi et 4.5–6 mm. lati, acuti, margine densius, ceterum extus intusque sparse puberulo-strigosi, 7-nervii. Corolla rubra, 2.9 cm. longa, margine dense, ceterum extus sparse puberulo-strigosa; tubus infundibuliformis, 1.7 cm. longus et ad orem 1.0 cm. diam.; lobi ovato-triangulares 9 mm. longi et basi 5.5 mm. lati. Stamina 1.8 cm. longa; filamenta 8 mm.; antherae 10 mm. longae, connectivo carinato et granulato in appendicem circ. 0.5 mm. longam producto. Fructus nondum notus.

Habitat terrae Borneënsis partem occidentalem.

Borneo: Western Division: Sintang, S. Malang, 111° 20′ E.long., 1° N.lat., alt. 70 m., *Winkler 1298* (HBG, typus); ibidem, S. Gulu, 112° 25′ E.long., 0° 16′ N.lat., alt. 150 m., *id. 181* (HBG), n.v.

A specimen collected by the Expedition *Nieuwenhuis* near the S. Blu-u (*541* [L], *A. multinervia* Val. in sched.) comes very near to the plant described above, and may be conspecific. Its leaves, however, are less distinctly bullate, the hairs on the nerves are more patent, and the pedicels and ovaries less densely grey-strigose; that the thecae seem to be less distinctly ciliolate and the connective but indistinctly granulate, may be due to the immaturity of the buds and their bad state of preservation.

The inflorescence of *A. bullata* has three main branches, but the latter are so short that their existence is easily overlooked. From a morphological point of view their presence, nevertheless, is of importance, because it shows that the umbelliform inflorescence of this subgenus is to be derived from the trichotomously corymbose one found in several other subgenera.

Acranthera bullata is easily distinguishable by its bullate leaves. It comes nearest to *A. Johannis-Winkleri* Merr. and *A. monantha* Val., which it resembles in the great length of the calyx-lobes and the infundibuliform

corolla, but from which it differs in the many-nerved leaves and the several-flowered inflorescences.

13. **Acranthera Johannis-Winkleri** Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 285. 1937.

Herba ascendens, usque ad 25 cm. alta, ad anthesin interdum decumbens et e basi enovationes emittens. Caulis primum villosus, deinde glabrescens, diametro ad apicem 2 mm., basin versus usque ad 4 mm. aucto, internodiis 0.5–2.5 cm. longis. Folia petiolo 1–4 cm. longo, primum dense, deinde sparse villoso instructa; lamina elliptica vel obovata, 4–13.5 cm. longa et 1.8–5.2 cm. lata, apice subacuminata, basi cuneata, margine pilis stramineis longis primum dense, deinde sparsius substrigosa, supra glaberrima, subtus sparse sed costa nervisque densius villosa, utrimque opaca, supra sicc. olivacea, subtus fusca, nervis utroque latere costae 6 vel 7. Stipulae oblongae, 1–2 cm. longae et 3–7 mm. latae, obtusae vel acutae sed semper mucronatae, extus sparse villosae, costa prominula, ante folia deciduae. Inflorescentia subsessilis, 1- vel 2-flora, mox a ramulo axillari in positionem lateralem coacta; bracteae oblongae, 7 mm. longae et 3 mm. latae. Flores pedicello densius griseo-villoso, usque ad 10 mm. longo elati. Ovarium rubellum, cylindricum, 9 mm. longum et 0.7 mm. diam., densius griseo-villosum. Calycis lobi laete virides, lanceolati, 17 mm. longi et 3.5–4 mm. lati, acuti, extus intusque sparse, margine densius pubescentes, 7-nervii, nervis lateralibus a venulis interdum vix distinguendis. Corolla aurantiaca, 3.7 cm. longa, 5- vel 6-mera, extus praesertim basin versus pilis brevibus pubescens; tubus infundibuliformis, 2 cm. longus et ad orem 1 cm. diam.; lobi triangulares 17 mm. longi et basi 6 mm. lati. Stamina 1.7 cm. longa; filamenta 7.5 mm.; antherae 9.5 mm. longae, connectivo carinato et granulato in appendicem circ. 0.5 mm. longam producto. Fructus cylindricus, nondum plene maturus 16 mm. longus et 2.5 mm. diam., 6-costatus, sparse griseo-pubescens.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Western Division: Sintang, S. Raun, 113° 15′ E.long., 0° 40′ N.lat., alt. 200 m., *Winkler 1559* (HBG, typus); S.Obat, 113° 20′ E.long., 0° 55′ N.lat., alt. 80 m., *id. 1389* (HBG) n.v.

If we may assume that the form and structure of the fruit of this species is typical for the whole subgenus, the difference between the latter and the subgenus *Phanerochiton* becomes still more prominent.

Acranthera Johannis-Winkleri resembles *A. bullata* in the long calyx-lobes, the infundibuliform corolla-tube and the carinate and granulate connective, but is easily distinguishable by the smooth leaves, the smaller stipules, 1- or 2-flowered inflorescence, the greenish colour of the calyx-lobes and the orange colour of the corolla, and the greater length of the latter's lobes. *Acranthera monantha* Val. is probably even more closely allied, but comparison is made difficult by the circumstance that we have no information with regard to the connective and with regard to the colour of calyx and corolla. On account of the very close resemblance in other respects, the connective will probably prove to be carinate and granulate: in the key to the species use has already been made of this character.

From *A. variegata* Merr. and *A. aurantiaca* Val. ex Brem. both *A.*

Johannis-Winkleri and *A. bullata* differ in the shape of the corolla-tube, the greater length of the calyx-lobes, the longer filaments and the distinctly carinate and granulate connective.

14. **Acranthera monantha** Val. in Bot. Jahrb. 48: 111. 1912. — North ? Borneo.

Of this species I have seen no specimens, but judging from the description there can be little doubt that it is nearly related to *A. Johannis-Winkleri* Merr. No information, however, is available with regard to the flower-colour, the shape of the connective and that of the *receptaculum pollinis*. The plant, moreover, is described as unisexual, but this is doubtless a mistake. The type, *Beccari 3154*, was, according to Valeton l.c., collected in North Borneo, but as some other specimens whose numbers differ but slightly from that of this plant, are known to have been collected in Sarawak, I suppose that this is a mistake.

15. **Acranthera variegata** Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 285. 1937.

Herba subrosularis. Caulis ad apicem pilis brevibus satis dense griseo-strigosus, basin versus plus minusve glabrescens, diametro ad apicem 1.2 mm., basin versus usque ad 4 mm. aucto, internodiis 5–10 mm. longis. Folia petiolo 0.4–2 cm. longo, pilis brevibus satis dense griseo- vel fulvo-strigoso instructa; lamina obovata, 7–16 cm. longa et 3–6.7 cm. lata, apice breviter acuminata, basi acuta vel saepius subtruncata et prope petiolum subito contracta, margine dense fulvo-strigosa, supra glaberrima, subtus costa nervisque pilis brevibus dense fulvo-strigosa, venulis pilis brevibus minus dense strigosis, utrimque opaca, maculis irregularibus albo-variegata, sicc. supra olivacea, subtus fusca, nervis utroque latere costae 4 vel 5. Stipulae ovato-oblongae, circ. 1 cm. longae et 4 mm. latae, subacutae, extus sparse strigosae, costa prominente, subpersistentes. Inflorescentia subsessilis, umbelliformis, floribus 6–12; bracteae lineari-filiformes, circ. 4 mm. longae. Flores pedicello pilis brevissimis dense griseo-strigoso usque ad 1.5 cm. longo elati. Ovarium cylindricum, 5 mm. longum et 0.8 mm. diam., ut pedicellus dense griseo-strigosum. Calycis lobi laete virides, lanceolati, 10 mm. longi et 1.8–2.2 mm. lati, acuti, extus costa et margine pilis brevibus densius, ceterum sparse strigosi, 5-nervii. Corolla laete sulphurea, 18.5 mm. longa, margine densius, ceterum extus sparse et brevissime griseo-strigosa; tubus anguste campanulatus, 10 mm. longus et 4 mm. diam.; lobi oblongi, 8.5 mm. longi et 2.5 mm. lati. Stamina 8.5 mm. longa; filamenta 2 mm.; antherae 6.5 mm. longae, thecis basi solum ciliolatis, connectivo nec granulato nec carinato in appendicem vix conspicuam producto. Fructum nondum vidi; fide *Merrill* l.c. subteres vel rotundato-angulatus, 1 cm. longus et 2–2.5 mm. diam.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Western Division: Sintang, S. Malang, 113° 20′ E.long., 1° N.lat., *Winkler 1294* (HBG, typus).

So far three species of *Acranthera* are known to be provided with variegated leaves. The two others are: *A. maculata* Val. and *A. Hallierii* Val. *Acranthera maculata* also belongs to the subgenus *Dichroanthes*, but to the series Monopodiales; it is moreover easily distinguishable from *A. variegata* by its solitary flowers. *Acranthera Hallierii* has a mitriform *receptaculum pollinis*, and belongs therefore to the subgenus *Mitracme*.

It differs further from *A. variegata* in the presence of 6–7 pairs of nerves in the leaves, the deciduous stipules, and the position of the inflorescences, which are not found at the end of the stem, but at the end of opposite brachyblasts.

The nearest ally of this species is doubtless *A. aurantiaca* Val. ex Brem., whose leaves are longer and narrower, on the upper side strewn with a few hairs, and entirely green, and whose inflorescences consist of fewer but larger flowers.

A peculiarity of *A. variegata* not mentioned in the description, is the presence of a ring of cohering colleters on the inside of the calyx; it is produced in triangular slips between the calyx-lobes. In all other species the number of colleters is so much smaller that they are unable to form a complete ring; sometimes, however, they cohere in groups, especially in the gaps between the calyx-lobes.

16. **Acranthera aurantiaca** Val. in sched.; typus: *Teysmann H.B. 8031* (L).

Herba subrosularis. Caulis ad apicem satis dense griseo-strigosus, basin versus plus minusve glabrescens, diametro ad apicem 2.5 mm., basin versus usque ad 5 mm. aucto, internodiis 5–10 mm. longis. Folia petiolo 0.5–2.5 cm. longo, satis dense fulvo-strigoso instructa; lamina obovata vel saepius oblanceolata, 9–16 cm. longa et 4–5 cm. lata, apice acuta vel subacuminata, basi acuta vel cuneata, margine densius strigosa, supra pilis perpaucis sed satis longis strigosa, subtus costa nervisque dense, venulis sparsius fulvo-strigosa, utrimque opaca, haud variegata, sicc. supra olivacea, subtus fusca, nervis utroque latere costae 5 vel 6. Stipulae ovatae, circ. 1 cm. longae et 8 mm. latae, subacutae, extus sparse strigosae, costa prominula, sub-persistentes. Inflorescentia subsessilis, umbelliformis, floribus 4–6; bracteae lineares, circ. 5 mm. longae. Flores pedicello pilis brevibus dense griseo-strigoso, usque ad 1.5 cm. longo elati. Ovarium cylindricum, 5 mm. longum et 1 mm. diam., ut pedicellus dense griseo-strigosum. Calycis lobi lineares, 12 mm. longi et 1.8–2.2 mm. lati, acuti, margine et costa pilis brevibus densius, ceterum utrimque sparse strigosi, 3- vel 5-nervii. Corolla aurantiaca, in exemplo solo praeservato apice ab insectis destructa, extus pilis brevibus sparse strigosa; tubus anguste campanulatus minime 15 mm. longus et 4 mm. diam. Stamina 16 mm. longa; filamenta 5 mm.; antherae 11 mm. longae, thecis basi solum et vix conspicue ciliolatis, connectivo nec carinato nec granulato in appendicem brevissimam producto. Fructus nondum notus.

Habitat terrae Borneënsis partem occidentalem.

Borneo: Western Division: Singkawang, Passi (circ. 109° E.long., 1° N.lat.), *Teysmann H.B. 8031* (L, typus).

The differences between this species and the preceding one have been summarized in the note attached to the latter.

Series B. MONOPODIALES

Inflorescentiae brachyblastos oppositos, uno jugo foliorum rudimentariorum instructos terminantes. Stigmata libera, subulata. — Species 17–23.

17. **Aeranthera salmonea** Brem. n. spec.; typus: *Rutten 119* (U).

Herba ascendens, circ. 30 cm. alta. Caulis primum pilis fulvis breviter substrigosus, deinde plus minusve glabrescens, diametro ad apicem 2.5 mm., basin versus usque ad 4 mm. aucto, internodiis 2.2–6.5 cm. longis. Folia petiolo 2.5–4.5 cm. longo, pilis brevibus fulvis primum dense, deinde sparsius substrigoso instructa; lamina obovata, 10.5–17 cm. longa et 4.2–6.2 cm. lata, apice acuta vel breviter acuminata, basi cuneata, margine primum densissime, deinde minus dense strigosa, supra glaberrima, subtus costa nervisque pilis longioribus densissime fulvo-strigosa, venulis pilis brevibus densissime, inter venulos sparse strigosa, utrimque opaca, sicc. supra olivaceo-brunnea vel subnigra, subtus fusca, nervis utroque latere costae 5–8. Stipulae oblongae vel ovato-oblongae, 2.2 cm. longae et 8–13 mm. latae, subacutae, extus sparse, margine densius strigosae, costa basin versus prominula, ante folia deciduae. Inflorescentiae basi foliis duobus ovatis, 15 mm. longis et 7.5 mm. latis instructae, sessiles, umbelliformes, 5-usque ad 9-florae; bracteae lineari-lanceolatae, 5 mm. longae et 1 mm. latae. Flores pedicello pilis brevibus densius griseo-strigoso, usque ad 1.5 cm. longo elati. Ovarium cylindricum, 12 mm. longum et 1 mm. diam., ut pedicellus dense griseo-strigosum. Calycis lobi lineari-lanceolati vel lanceolati, 12 mm. longi et 2.5–5 mm. lati, acuti et mucronati, rubri, utrimque pilis brevissimis sparse, margine densius strigosi, 5-nervii. Corolla salmonea, 3 cm. longa, extus pilis brevissimis sparse, margine densius strigosa; tubus anguste campanulatus, 2.5 cm. longus et 8 mm. diam.; lobi ovati, 5.5 mm. longi latique, acuti. Stamina 2.2 cm. longa; filamenta 13 mm.; antherae 9 mm. longae, connectivo carinato et granulato, basin versus valde gibboso, apice in appendicem crassiusculam, vix 0.5 mm. longam producto. Receptaculum pollinis squamis fungiformibus obtectum. Fructus nondum notus.

Habitat terrae Borneënsis partem orientalem.

BORNEO: Southern and Eastern Division: Samarinda, above Pamaluan, 116° E.long., 1° S.lat., *Rutten 119* (U, typus), "on the river bank in primary forest": the lower part of the stem and the lower leaves of his specimen indeed are covered with mud.

The papillae by which the *receptaculum pollinis* of this and the two next species is covered, are somewhat different from those of the species previously dealt with: they are united to fungiform scales, i.e. at the base they form a rather thick stipe and spread at the top. In the species 20–23 their structure is unknown; Valeton's fig. 7 on t. 395 of Ic. Bog. 4: suggests that they may be of a similar nature in *A. maculata*.

Aeranthera salmonea resembles the next species, *A. megaphylla* Brem., in the umbelliform inflorescence, but is easily distinguishable by the smaller size of the leaves and stipules and by the shorter calyx-lobes.

18. **Aeranthera megaphylla** Brem. n. spec.; typus: *Coll. ign. H.B. 409* (L).

Probabiliter planta ascendens. Caulis glaber, diametro ad apicem 8 mm., basin versus aucto, internodiis paucis preservatis circ. 1 cm. longis. Folia petiolo 12–12.5 cm. longo, breviter et sparse strigoso instructa; lamina obovata, circ. 30 cm. longa et 12 cm. lata, apice caudato-acuminata, basi acuta vel subcontracta, margine satis dense sed vix conspicue strigosa.

supra costa quae basin versus est breviter et satis dense strigosa excepta glaberrima, subtus costa nervisque pilis brevibus densissime fulvo-strigosa, inter nervos pilis brevissimis parce strigosa, utrimque opaca, sicc. supra rubro-brunnea, subtus fusca, nervis utroque latere costae 13. Stipulae lanceolato-oblongae, 3.5–4.5 cm. longae et 10–13 mm. latae, acutae, extus pilis brevibus satis dense, margine densius strigosae, costa prominente, subpersistentes. Inflorescentiae basi foliis duobus ovato-lanceolatis, 13 mm. longis et 5.5 mm. latis instructae, sessiles, umbelliformes, 5-florae; bracteae lineari-lanceolatae, 12 mm. longae et 3 mm. latae. Flores pedicello pilis brevissimis densissime griseo-strigoso, circ. 5 mm. longo elati. Ovarium cylindricum, 10 mm. longum et 1 mm. diam., ut pedicellus densissime griseo-strigosum. Calycis lobi lineares, 20 mm. longi et 4–5 mm. lati, acuti, pilis brevissimis extus densius, intus sparsius strigosi, costa prominula, 5-nervii. Corolla colore ignoto, in exemplo examinato nondum plene matura 15 mm. longa, extus pilis brevissimis densissime strigosa; tubus anguste campanulatus 10 mm. longus et 4 mm. diam.; lobi ovati, 5 mm. longi et 4 mm. lati, acuti. Stamina filamentis nondum elongatis; antherae 10 mm. longae, connectivo carinato et granulato, basin versus gibboso, in appendicem 0.6 mm. longam producto. Receptaculum pollinis squamis fungiformibus obtectum. Fructus nondum notus.

Habitat terram Borneënsem, probabiliter partem centralem.

BORNEO: s.l., *Collector ignotus H.B. 409* (L, typus).

The Leiden herbarium received this specimen from Buitenzorg, but neither the name of the collector nor the exact locality is given. It may have been one of the plants collected by the Expedition *Nieuwenhuis;* in that case it will probably have been collected in the central part.

In its umbelliform inflorescences it resembles *A. salmonea;* in the length of the petioles, the large size of the leaf blade and the long stipules, *A. longipetiolata* Merr. ex Brem. The flower buds investigated by me, were apparently very immature: judging from the size of the anthers, I suppose that they will probably reach about the same size as those of *A. salmonea* and *A. longipetiolata.*

19. **Acranthera longipetiolata** Merr. n. nom. in sched., 7. XII. 1937.
Acranthera longipes Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937, homon. illeg. nam non Merr. in Papers Mich. Acad. Sci. 19: 194. 1934 (cf. species 8).

Herba ascendens, probabiliter circ. 25 cm. alta. Caulis primum sparse et vix conspicue strigosus, deinde glabrescens, diametro ad apicem 7 mm., basin versus usque ad 12 mm. aucto, internodiis 1–2 cm. longis. Folia petiolo 6–12 cm. longo, pilis brevissimis primum dense griseo-strigoso, deinde sparsius fusco-strigoso instructa; lamina oblonga vel oblongo-obovata, 20–25 cm. longa et 9–10 cm. lata, apice acuminata, basi acuta vel saepius subobtusa sed prope petiolum subito contracta, margine dense griseo-strigosa, supra glaberrima, subtus costa nervisque pilis brevissimis densissime griseo-strigosa, inter nervos pilis brevissimis vix conspicue sed satis dense strigosa, utrimque opaca, sicc. supra saturate rubro-brunnea, subtus fusca, nervis utroque latere costae 10. Stipulae oblongae, 3.5–4.5 cm. longae et 13–16 mm. latae, obtusae, extus pilis brevibus satis dense griseo-strigosae, costa basin versus prominente, persistentes. Inflorescen-

tiae basi foliis duobus rudimentariis ovato-lanceolatis, 15 mm. longis et 6 mm. latis instructae, sessiles, unifiorae. Flos subsessilis. Ovarium cylindricum, 13 mm. longum et 1.5 mm. diam., pilis brevissimis densissime griseo-strigosum. Calycis lobi purpurei, lanceolati, 23 mm. longi et 4–6 mm. lati, acuti, extus intusque pilis brevissimis sparse, margine densius griseo-strigosi, 5-nervii. Corolla rubro-aurantiaca, 3 cm. longa, extus pilis brevissimis sparse, margine densius griseo-strigosa; tubus anguste campanulatus 24 mm. longus et 7 mm. diam.; lobi ovati, 6 mm. longi et basi 5 mm. lati, acuti. Stamina 2.2 cm. longa; filamenta 12 mm.; antherae 10 mm. longae, connectivo carinato et granulato, basin versus gibboso, apice in appendicem crassiusculam, circ. 0.5 mm. longam producto. Receptaculum pollinis squamis fungiformibus obtectum. Fructus nondum notus.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Western Division: Sintang, Upper Kapuas Mts., Bt Obat, 113° 20′ E.long., 1° N.lat., alt. 150 m., *Winkler 1345* (HBG, typus).

Acranthera longipetiolata differs from the two preceding species in the uniflorous inflorescences, and from the other species belonging to this series in the great length of the petioles and the large size of the leaves and stipules.

An apparently nearly related species is represented by a specimen collected in Sarawak (Nat. coll. *1036* [AA]). Its leaves are much smaller (13–18 cm. × 4.5–6 cm.) attenuate at both ends, and provided with six instead of ten pairs of nerves; the petioles are shorter and very sparsely strigose, and the stipules are nearly glabrous. As flowers and fruits are wanting, it does not seem advisable to name it.

20. **Acranthera axilliflora** Val. in Bot. Jahrb. 44: 550. 1910; Val. in adnot. ad *A. maculatam* Val. in Ic. Bog. 4: 284. 1914. — South-east Borneo.

The type of this species, of which no material was available to me, was collected by Hub. Winkler between Batu Babi and Lumowia in South-east Borneo. The description is in some important points incomplete, but in a note attached to the description of *A. maculata* Val. it is stated that it agrees with the latter in the structure of its inflorescence and flowers, and that it differs from that species in the same way as *A. abbreviata* Val., viz. in the ovate-lanceolate instead of linear calyx-lobes and in the larger size of the leaves with their 6 or 7 instead of 4 or 5 pairs of nerves. Although in the description of *A. abbreviata* itself no mention is made of *A. axilliflora*, the affinity between these two species is apparently closer than that existing between *A. axilliflora* and *A. maculata*. In fact, the only difference between *A. axilliflora* and *A. abbreviata* which could be detected by a comparison of the descriptions, lies in the nature of the indumentum.

21. **Acranthera abbreviata** Val. in Ic. Bog. 4: 181. t. 355. 1913; Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 283. 1937. — West Borneo.

I found a duplicate of the type of this species in the Leiden herbarium, but as it has no flowers, it is not worthwhile describing it.

The details of the flower are badly represented in the figures accompany-

ing Valeton's description, but as the inflorescences are borne on opposite brachyblasts, the filaments long and the thecae ciliolate, there can be no doubt that it belongs to this series.

The type was collected by Hallier at Liang Agang in the Müller Mts. (113° 20′ E.long., 0° 40′ N.lat.). Another specimen was found by Winkler on the Bt. Raja (112 40′ E.long., 0 40′ N.lat.) at an altitude of 1250 m. (cf. Merrill l.c.).

22. **Acranthera hirtistipula** Val. in Ic. Bog. 4: 277, t. 392. 1914. — Central Borneo.

Of this species too no material was available to me. Valeton l.c. states that it shows a "superficial" resemblance to *A. maculata* Val., from which it should differ in the small size and deciduousness of the stipules, the number of pairs of nerves, the larger size of the leaf-tip and the stamens. The filaments, namely, are said to be slightly shorter than the anthers, but as the figures show that the flowers investigated by Valeton were not yet fully mature, this is by no means certain. It is quite possible that in the open flower the filaments will prove to be longer. The connective is described as broad and flat, but in fig. 3 it is shown as carinate, and I have little doubt that this is right, and that the resemblance between *A. hirtistipula* and *A. maculata*, therefore, is not merely "superficial," but that the two species are nearly allied. By the aid of the characters given in the key they will, nevertheless, prove easily distinguishable.

23. **Acranthera maculata** Val. in Ic. Bog. 4: 284, t. 395. 1914. — Central Borneo.

Of this species too I have seen no material. The Buitenzorg herbarium apparently possesses a large number of specimens, all collected during the Expedition Nieuwenhuis in Central Borneo. Of one of the specimens the flowers are said to be white, but the colour of the others is not mentioned. The white colour, however, may be a mistake. Figure 8 represents a fruit which is said to belong to this species, but this apparently is wrong, for it is more or less rostrate and lacks the persistent calyx: it might pertain to a *Cyrtandra*. It is possible, therefore, that one of Valeton's specimens was mis-identified, and the white flowers might belong to this one.

Valeton's figure gives the impression that the uppermost flower is terminal, and the others solitary at the nodes; if this were so, this species could not belong to the series Monopodiales. As the description, however, makes no mention of a terminal flower, and as the bifid stigma points in the direction of the species with opposite inflorescences, the impression created by the figure is probably wrong.

Subgenus G. ABLEPHARIDESMA Brem. subgen. nov.

Herbae ascendentes. Caulis pro genere tenuis. Folia pro genere parva, supra glaberrima, paucinervia, venulis paucis laxe reticulatis. Stipulae oblongae, apice acutae, costa prominente, usque ad 1 cm. longae. Inflorescentiae brachyblastos oppositos, foliis rudimentariis munitos ter-

minantes, subsessiles, uniflorae. Flos 4- vel 5-merus, subsessilis. Corolla in specie ubi color notus albida, tubo anguste campanulato. Stamina filamentis glabris et liberis, quam antheris multo brevioribus, antheris haud ciliolatis, connectivo haud carinato, in appendicem brevem producto. Discus inconspicuus. Receptaculum pollinis thecis subaequilongum, fusiforme; stigmata brevia. Fructus cylindricus, fortiter 5- vel 6-costatus. Semina carunculata.

Species adhuc notae duae terram Borneënsem habitantes. Subgeneris typus: *A. Endertii* Brem. n. spec. v. infra.

KEY TO THE SPECIES

Shoots, petioles and underside of the leaves pubescent. Leaves mostly obovate and shortly acuminate. Stipules more or less persistent. Flowers 5-merous. Corolla 17 mm. long. — East Borneo.....24. *A. Endertii*
Shoots, petioles and underside of the leaves strigose. Leaves lanceolate-elliptic, caudate-acuminate. Stipules early deciduous. Flowers 4-merous. Corolla 12 mm. long. — West Borneo.....25. *A. parviflora*

24. **Acranthera Endertii** Brem. n. spec.; typus: *Endert 2605* (BZ).

Herba ascendens, 13–20 cm. alta. Caulis primum pilis fulvis, satis longis dense hirto-pubescens, deinde plus minusve glabrescens, diametro ad apicem 2 mm., basin versus usque ad 4 mm. aucto, internodiis 0.6–2 cm. longis. Folia petiolo 1.2–3 cm. longo, pilis fulvis dense hirto-pubescente instructa; lamina plerumque obovata, foliorum aliquorum tamen oblonga vel lanceolato-elliptica, 5–10.5 cm. longa et 2.8–5 cm. lata, apice breviter acuminata, basi acuta vel prope petiolum subito contracta, margine dense ciliata, subtus costa nervisque pilis fulvis dense hirto-pubescens, venulis principalibus pilis brevioribus dense obtectis, inter venulos primum sparse pubescens, utrimque opaca, sicc. supra olivacea, subtus dilute viridis, nervis utroque latere costae 3 vel 4. Stipulae 6–10 mm. longae et 3.5–4.5 mm. latae, apice et costa hic inde colletris longis sparsae, ubique dense sed costa densissime strigosae, subpersistentes. Inflorescentiae basi foliis duobus ovatis, 3 mm. longis instructae; bracteae duae lineares, vix 2 mm. longae. Flos subsessilis, 5-merus. Ovarium cylindricum, 5.5 mm. longum et 1 mm. diam., breviter sed densissime griseo-strigosum. Calycis lobi lineares, 8 mm. longi et 0.6–0.9 mm. lati, acuti, extus intusque pilis brevissimis dense, margine et costa densissime griseo-strigosi, 3-nervii. Corolla albida, 17 mm. longa, extus pilis brevissimis dense strigosa; tubus 12 mm. longus et 3.5 mm. diam.; lobi ovati, 5 mm. longi et 3.5 mm. lati, acuti. Stamina 8 mm. longa; filamenta 2.5 mm.; antherae 6.5 mm. longae. Fructus 2.5 cm. longus et 3 mm. diam., pilis brevibus sparse strigosus.

Habitat terrae Borneënsis partem orientalem.

BORNEO: Eastern and Southern Division: Samarinda, West Kutai, H. Ibut, alt. 130 m., *Endert 2604* (BZ, typus).

The points of resemblance between this species and *A. parviflora* Val. are sufficiently expressed in the description of the subgenus, the points of difference in the key to the species.

25. **Acranthera parviflora** Val. in Ic. Bog. 4: 289, t. 398. 1914; Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 283. 1937.

Herba ascendens, 25–50 cm. alta. Caulis primum pilis brevissimis dense fulvo-strigosus, deinde plus minusve glabrescens, diametro ad apicem 1.5 mm., basin versus usque ad 4 mm. aucto, internodiis 0.8–5 cm. longis. Folia petiolo 1.5–3 cm. longo, pilis brevissimis strigoso instructa; lamina lanceolato-elliptica, 6.5–9 cm. longa et 2.5–3.8 cm. lata, apice caudato-acuminata, basi acuta, margine pilis brevibus satis dense substrigosa, subtus primum praesertim costa nervisque densissime albido-strigosa, deinde costa nervisque densius, inter nervos ubique sparse et pilorum brevitate et colore fusco vix conspicue strigosa, utrimque opaca, sicc. supra saturate olivaceo-brunnea, subtus brunnea, nervis utroque latere costae 4 vel 5. Stipulae 9–11 mm. longae et 3 mm. latae, in colletrum satis longum exeuns, extus sparse et breviter strigosae, mox deciduae. Inflorescentiae basi foliis duobus ovatis, 2.5 mm. longis instructae; bracteae filiformes breviores vel nullae. Flos subsessilis, 4-merus. Ovarium cylindricum, 4 mm. longum et 0.8 mm. diam., breviter sed dense griseo-strigosum. Calycis lobi lineares, 7–9 mm. longi et 1.2–1.5 mm. lati, acuti, pilis brevibus utrimque sed extus densius griseo-strigosi. Corolla colore ignoto, 1.2 cm. longa, extus breviter sed densissime griseo-strigosa; tubus 7 mm. longus et 3 mm. diam.; lobi ovati, 5 mm. longi et 3.5 mm. lati, acuti. Stamina 6 mm. longa; filamenta 1 mm.; antherae 5 mm. longae. Fructus forsitan nondum plene maturus fide Valeton 1.5–2 cm. longus et 2–2.5 mm. diam., dense sed breviter strigosus.

Habitat terrae Borneënsis partem occidentalem.

BORNEO: Western Division: Sintang, Amai Ambit, *Hallier 3247 b* (L, dupl. typi); Liang Agang, 113° 20′ E.long., 0° 40′ N.lat., *id. 2817 b*, n.v.; Bt. Tilung, 113° 20′ E.long., 0° 45′ N.lat., alt. 800 m., *Winkler 1469* (HBG), n.v.

SUBGENUS H. MITRACME BREM. SUBGEN. NOV.

Herbae subrosulares, ascendentes vel suberectae. Folia laxe reticulatae. Stipulae ovatae vel oblongae, apice plerumque obtusae, internodiis plurimis longiores, extus plerumque hic inde colletris instructae, reticulatae. Inflorescentia terminalis, nunc bis vel semel trichotoma, floribus ad apices ramulorum fasciculatis, nunc umbelliformis. Corolla alba vel dilute tincta, tubo anguste campanulato. Stamina filamentis glabris et liberis, quam antheris multo brevioribus, antheris connectivo nunc ciliolato nunc eciliolato, haud carinato, in appendicem plerumque brevem producto. Discus inconspicuus. Stylus cylindricus; receptaculum pollinis thecis multo brevius, mitriforme. Fructus cylindricus. Semina reticulata vel carunculata.

Species adhuc notae septem terram Borneënsem et insulam Filippinam Mindanao dictam habitantes. Subgeneris typus: *A. velutinervia* Brem. n. spec. v. infra.

KEY TO THE SPECIES

Connective ciliolate. Large plants with twice trichotomous inflorescences provided with large bracts.....Series a. **Ciliolatae**

Leaves 14–20 cm. long, provided with 6 or 7 pairs of nerves; midrib and nerves on the underside velutinous. Calyx-lobes lanceolate-oblong, 13 mm. long. Fruit 3 cm. long and 1.8 mm. diam. — North Borneo.....26. *A. velutinervia*

Leaves 30–35 cm. long, provided with 11 or 12 pairs of nerves; midrib and nerves

on the underside villous or slightly hirsute. Calyx lobes ovate, 6 mm. long. Fruit 1 cm. long and 4.5 mm. diam. — Widespread in Borneo, but not in the northern part.....27. *A. frutescens*

Connective eciliolate. Low plants with trichotomous or umbelliform inflorescences; bracts, except in *A. philippinensis*, small.

Inflorescences trichotomous. Leaves with 7–11 pairs of nerves.

Leaves obovate, velutinous on the upper side at least at first, on the underside on midrib and nerves persistently. Stipules neither scarious nor early deciduous.....Series b. **Philippinenses**

One species only. — Mindanao.....28. *A. philippinensis*

Leaves lanceolate, on the upper side entirely glabrous, strigose on the underside on midrib and nerves. Stipules scarious and early deciduous.....Series c. **Iteophyllae**

One species only. — Central and West Borneo.....29. *A. lanceolata*

Inflorescences umbelliform. Leaves with 5–8 pairs of nerves.....Series d. **Umbelliflorae**

Midrib strigose towards the leaf-base on the upper side. Calyx-lobes linear or lanceolate.

Leaves lanceolate, entirely green. Stipules oblong and acute. — Central Borneo.....30. *A. Nieuwenhuisii*

Leaves lanceolate-elliptic or obovate, variegated. Stipules ovate and obtuse. — Central Borneo.....31. *A. Hallierii*

Leaves entirely glabrous on the upper side. Calyx-lobes ovate-lanceolate. — North Borneo.....32. *A. atropella*

SERIES A. CILIOLATAE

Herbae robustiores. Inflorescentia bis trichotoma, floribus 2–5 ad apices ramulorum fasciculatis; bracteae magnae, ad anthesin deciduae. Connectivum ciliolatum. — Species 26 et 27.

26. **Aeranthera velutinervia** Brem. n. spec.; typus: *J. & M. S. Clemens 32093* (L).

Herba suberecta, minime 50 cm. alta. Caulis primum breviter sed densissime, deinde minus dense fulvo-strigosus, diametro ad apicem 3 mm., basin versus usque ad 7 mm. aucto, internodiis 1.5–7 cm. longis. Folia petiolo 4.5–5.5 cm. longo, densissime fulvo-strigoso et insuper parce villoso instructa; lamina elliptica, 14–20 cm. longa et 6.5–10.5 cm. lata, apice acuta vel acuminata, basi contracta, margine ciliata, supra basin versus sparsissime strigosa, subtus costa nervisque densissime, inter nervos primum dense, deinde sparsius velutina, utrimque opaca, sicc. supra saturate rubro-brunnea, subtus brunnea, costa nervisque tamen pilorum praesentia fulvo-griseis, nervis utroque latere costae 6 vel 7. Stipulae oblongae, 3–4 cm. longae et 1.2–1.6 cm. latae, obtusae, extus ubique sed costa prominente et margine densius pubescentes, mox deciduae. Inflorescentia subsessilis; ramuli breviter sed densissime fulvo-strigosi, primarii 3–3.5 cm., secundarii 1.5–2 cm. longi; bracteae ramulorum primariorum nondum visae, ramulorum secundariorum lineari-oblongae, 2.5 cm. longae et 5–6 mm. latae, acutae, extus intusque satis dense, margine densius pubescentes, costa prominula, a stipulis parvis connatae, mox deciduae; bracteae aliae gradatim breviores et pro rato latiores; bracteae florales calycis lobis similiores; omnes ad anthesin deciduae. Flores sessiles. Ovarium cylindricum, 8 mm. longum et 1 mm. diam., breviter sed densissime griseo-strigosum. Calycis lobi lanceolato-oblongi, 13 mm. longi et 4 mm. lati,

acuti, extus intusque satis dense, margine densius pubescentes, 7-nervii. Corolla citrina, 18 mm. longa, extus puberulo-pubescens, margine densius pubescente; tubus 13 mm. longus et 3.5 mm. diam.; lobi rotundati 5 mm. longi latique. Stamina 8 mm. longa; filamenta 2 mm.; antherae 6 mm. longae, connectivo in appendicem 0.5 mm. longam producto. Receptaculum pollinis 2 mm. longum et basi 1.4 mm. diam.; stigmata subulata 1 mm. longa. Fructus (*Clemens 26812*) 3 cm. longus et 1.8 mm. diam., sparse pubescens. Semina carunculata.

Habitat terrae Borneënsis partem septentrionalem.

British North Borneo: Mt. Kinabalu: Penibukan, alt. 1200 m., *J. & M. S. Clemens 32095* (L, typus, AA, dupl. typi); Dallas, alt. 900 m.; *id. 26812* (L, AA, co-typus fructifer).

This species is in habit and in the structure of the inflorescence very similar to *A. frutescens* Val. but differs conspicuously from that species in the smaller size of the leaves, the fewer nerves, on the underside velutinous, the longer and narrower calyx-lobes and the longer and narrower ovaries and fruits.

27. **Acranthera frutescens** Val. in Engl., Bot. Jahrb. 44: 551. 1910, et in Ic. Bog. 4: 286. 1914 in adnot. ad *A. multifloram* Val.; non Merr. in Univ. Calif. Publ. Bot. 15: 280. 1929, quae est species affinis nondum descripta; — anne *A. multiflora* Val. in Ic. Bog. 4: 286, t. 396. 1914, adhuc incertum, sed haud improbabile v. infra).

Herba suberecta, 1.5–2 m. alta. Caulis primum villosus vel hirsuto-villosus, deinde glabrescens, diametro ad apicem 8 mm., basin versus usque ad 11 mm. aucto, internodiis 1.2–3 cm. longis. Folia petiolo 3–8 cm. longo, primum villoso vel hirsuto-villoso, deinde plus minusve glabrescente instructa; lamina obovata, 30–35 cm. longa et 10–12 cm. lata, apice caudato-acuminata, basi cuneata vel contracta, margine primum dense, deinde sparse substrigosa, primum insuper sparse ciliata, supra primum praesertim basin versus sparse strigosa, ultimo plus minusve glabrescens, subtus primum costa nervisque dense villosa vel hirsuto-villosa et inter nervos breviter sed satis dense strigosa, deinde costa nervisque sparsius villosa vel hirsuto-villosa et inter nervos vix conspicue strigosa, utrimque opaca, sicc. supra nigrescens et subtus fuscescens, nervis utroque latere costae 11 vel 12. Stipulae oblongae, 2.5 cm. longae et 1 cm. latae, obtusae, extus satis dense villosae vel hirsuto-villosae, costa vix prominula, mox deciduae. Inflorescentia subsessilis; ramuli dense fulvo-villosi, primarii ad anthesin circ. 1 cm., secundarii 7 mm. longi, post anthesin primarii usque ad 2.5 cm. et secundarii usque ad 1.5 cm. elongati; bracteae ovatae, 6–10 mm. longae et 3.5–6 mm. latae, extus et praesertim margine pubescentes, mox deciduae. Flores pedicello 0–2.5 mm. longo elati. Ovarium ovoideum, 2.5 mm. longum et 1.5 mm. diam., dense griseo-villosulum. Calycis lobi ovati, 6 mm. longi et 3–3.5 mm. lati, acuti, extus ubique sed margine densius pubescentes, 5-nervii, post anthesin usque ad 7 mm. longi et 5 mm. lati. Corolla viridula, extus griseo-villosula, fide Valeton 14–16 mm. longa; tubus 10–12 mm. longus; lobi late ovati, 4 mm. longi, acuti. Stamina 7 mm. longa, connectivo in appendicem filiformem 3 mm. (?) longam contracto. Fructus late cylindricus, 10 mm. longus et 4.5 mm. diam., villosus. Semina carunculata.

Habitat terrae Borneënsis partes occidentalem, australem et orientalem.

BORNEO: Southern and Eastern Division: Samarinda, between Semurung (S. Pasir) and S. Tarik, *Hub. Winkler 3032* (BD, typus), n.v.; West Kutai, near h. Puhus, alt. 90 m., *Endert 2501* (BZ). Western Division: Singkawang, district Landak, Ngabang, *Teysmann H.B. 11220* (L).

SARAWAK: Mt. Rayon, alt. 180 m., *Nat. coll. Ser. Mus. 5039* (AA); Mt. Matang, alt. 450 m., *J. & M. S. Clemens 22360* (AA).

The description given above has mainly been based on Endert's specimen. It deviates in the following points from the original one, given by Valeton: the number of pairs of nerves is 11 or 12, not 16; the bracts are slightly smaller (6–10 mm. × 3.5–6 mm. instead of 13 mm. × 8 mm.) and the calyx-lobes too are smaller (6 mm. × 3–3.5 mm. instead of 8 mm. × 5 mm.). The difference in the number of pairs of nerves is probably uncertain. As a comparison of Valeton's descriptions with the accompanying figures in the Icones Bogorienses prove, all nerves springing from the midrib were counted by him as primary ones, whereas I restrict the term to those which are readily comparable, leaving out the weaker nerves inserted in the intervals between the stronger ones. The differences in size of the bracts and the calyx-lobes offer a more serious difficulty, but these dimensions are probably rather variable.

Acranthera multiflora Val. in Ic. Bog. 4: 286, t. 396. 1914, is probably conspecific. The details of the flower-structure given by Valeton, are not to be trusted. I have little doubt that his flowers were both too young and badly preserved, and Valeton himself, as the remarks at the end of his description prove, attached no value to these details. In the Sarawak specimens quoted above, which agree well with Valeton's figure, the thecae are ciliolate and the *receptaculum pollinis* mitriform. The most important difference lies in the greater length of the fruits, which are said to be 2 cm. long. It is, of course, possible that a comparison of the authentic specimens will reveal the presence of differences not mentioned in the description, and that more than one species will have to be recognized, but for the present I prefer to consider them conspecific.

Elmer 20838, collected near Tawao in British North Borneo, and referred by Merrill l.c. to *A. frutescens*, differs in the size of the leaves and in the fewer nerves. It resembles in these characters *A. velutinervia*, from which it differs in the nature of the indumentum and above all by the short fruits, which are more like those of *A. frutescens*. It is doubtless an undescribed species, but as there were no flowers in the specimens which I could investigate, I am unwilling to describe it. As the flowers are described by Elmer as pale green, it is very probable that they will have been preserved at least in some of his specimens.

SERIES B. PHILIPPINENSES

Herba ascendens, valde pilosa. Stipulae extus sine colletris. Inflorescentia trichotoma. Corolla extus tomentosa. Connectivum eciliolatum. Placentae utroque loculo ovarii confluentes. Semina reticulata. — Species 28.

28. **Acranthera philippinensis** Merr. in Philip. Jour. Sci. 8: Bot. 32. 1913, Enum. Philip. Fl. Pl. 3: 517. 1923.

Herba ascendens, circ. 60 cm. alta. Caulis dense pubescens, diametro ad apicem 6 mm., basin versus usque ad 8 mm. aucto, internodiis 0.5–2.5 cm. longis. Folia petiolo 2–7 cm. longo, dense pubescente instructa; lamina obovata vel oblanceolata, 9–25 cm. longa et 3–10 cm. lata, apice acuta vel brevissime acuminata, basi cuneata vel contracta, margine densissime pubescens, supra primum velutina, deinde sparse pilosa vel subglabra, a basibus pilorum scabridula, subtus costa nervisque densissime, venulis dense velutina, ceterum sparse pubescens, utrimque opaca, sicc. supra olivacea, subtus fusca, nervis utroque latere costae 8–11. Stipulae ovato-oblongae, 2–2.5 cm. longae et 1.2 cm. latae, subacutae, extus sparse villosae, subpersistentes. Inflorescentia subsessilis; bracteae oblongae, villosae; inferiores 2.5 cm. longae et 1 cm. latae; aliae gradatim minores. Flores subsessiles. Ovarium cylindricum, 8 mm. longum et 1.4 mm. diam., griseo-tomentosum. Calycis lobi ad anthesin lanceolati, 8 mm. longi et 2.8 mm. lati, fructu spathulati, 14 mm. longi et 3 mm. lati, extus intusque satis dense, margine densius pubescentes. Corolla alba vel rosea, extus tomentosa, margine longius ciliata; tubus 7 mm. longus et 3.5 mm. diam.; lobi rotundati, 2.5 mm. longi latique. Stamina 6.5 mm. longa; filamenta 1 mm.; antherae 5.5 mm. longae, connectivo apiculato. Receptaculum pollinis 1 mm. longum et basi 1 mm. diam. Fructus 2.5 cm. longus et 4 mm. diam. Semina reticulata.

Habitat insulam Filippinam Mindanao dictam.

MINDANAO: Zamboanga, *Merrill 8309* (L, exemplum typi); *Ramos & Edaño B.Sc. 36647* (L); also near lake Lanao.

This species appears to be confined to the western part of Mindanao. As its nearest allies are found in Borneo, it would be interesting to know whether the genus is perhaps represented in the Sulu Islands too.

SERIES C. ITEOPHYLLAE

Herba ascendens. Folia anguste lanceolata, supra glaberrima. Stipulae scariosae. Inflorescentia semel trichotoma, floribus 3–5 ad apices ramulorum fasciculatis; bracteae parvae, mox deciduae. Connectivum eciliolatum. Discus squamis parvis cum filamentis alternantibus substitutus. — Species 29.

29. **Acranthera lanceolata** Val. in Ic. Bog. 4:282, t. 394. 1914; Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 283. 1937.

Herba ascendens, circ. 30 cm. alta, interdum pseudo-dichotome ramificata. Caulis pilis brevissimis primum densissime, deinde sparsius fulvo-strigosus, diametro ad apicem 2 mm., basin versus usque ad 4 mm. aucto, internodiis 0.5 -3 cm. longis. Folia petiolo 1.5–2.5 cm. longo, pilis brevibus densissime fulvo-strigoso instructa; lamina lineari-lanceolata vel lanceolata, 6–10.5 cm. longa et 1.3–2.0 cm. lata, ter usque ad sexies longior quam latior, apice caudato-acuminata, basi acuta vel cuneata, margine dense strigosa, supra glaberrima, subtus costa nervis necnon venulis principalibus a pilis brevibus primum albidis, deinde fulvis, primum densissime, deinde sparsius strigosa, primum supra nitidula, deinde utrimque opaca, sicc. supra nigrescens, subtus fuscescens, nervis utroque latere costae 7–11,

venulis subtus colore saturatiore conspicuis. Stipulae oblongae, 18 mm. longae et 7 mm. latae, apice obtusae, extus pilis brevissimis sparsae, scariosae, sicc. brunnescentes, costa basin versus prominente, mox deciduae. Inflorescentia subsessilis; rachis et ramuli pilis brevissimis densissime fulvo-strigosi; rachis 1.5–2.5 cm., ramuli 0.6–1.0 cm. longi; bracteae ovato-lanceolatae, circ. 2 mm. longae, extus sparse, margine densius pubescentes, mox deciduae. Flores breviter pedicellati. Pedicellus 0.5–2 mm. longus. Ovarium cylindricum, 6 mm. longum et 1.2 mm. diam., pilis brevissimis densissime fulvo-strigosum. Calycis lobi ovato-lanceolati, 6.5 mm. longi et 2.7–3.5 mm. lati, subobtusi, extus intusque pilis brevibus sparse, margine densius strigosi, 5-nervii. Corolla alba vel luteola, 10.5 mm. longa, extus pilis brevibus substrigosa; tubus 8 mm. longus et 3 mm. diam.; lobi 2.5 mm. longi latique, subobtusi. Stamina 7 mm. longa; filamenta 1.8 mm.; antherae 5.2 mm. longae, connectivo in appendicem anguste triangularem, 1.2 mm. longam producto. Receptaculum pollinis 1.3 mm. longum, basi 1.2 mm. diam. Fructus pedicello usque ad 3 mm. elongato elatus, 1.8 cm. longus et 2.2 mm. diam., sparse pubescens. Semina carunculata.

Habitat terrae Borneënsis partes centralem et orientalem.

CENTRAL BORNEO: Tadjuk, *Nieuwenhuis 206* (1896/97); S. Haraseh, *id. 214* (1896/97); S. Senoon, *id. 30* (1898), omnes fide *Valeton* l.c. Western Division; S. Serawai near Djotta, 112° 30′ E.long., 0° 30′ S.lat., alt. 100 m., *Winkler 323*, fide *Merill* l.c.

SARAWAK: Saribas, Paku, *Haviland & Hose 1562* (L).

The description given above has been based on the specimen collected by *Haviland & Hose*, but agrees in all essential points with that given by Valeton. The latter says of the inflorescences "vulgo tres in apice caulis umbellatae," but this is doubtless a mistake, for inflorescences arranged in this way are entirely unknown in this genus; the short common peduncle has apparently been overlooked. The *receptaculum pollinis*, which he in the usual way takes for the stigma, is accurately described as "conicum acutum," but badly represented in fig. 6, where it shows an ovoid shape.

This species is easily recognizable among all its allies by the narrowly lanceolate leaves. A rather curious feature are the five small disk-scales alternating with the stamens.

SERIES D. UMBELLIFLORAE

Herbae ascendentes vel subrosulares. Inflorescentia umbelliformis; bracteae parvae. Connectivum ciliolatum. — Species 30–32.

30. **Acranthera Nieuwenhuisii** Val. in sched.; typus: *Jaheri* (Exped. *Nieuwenhuis*) *754* (L).

Herba ascendens, circ. 15 cm. alta. Caulis primum breviter sed densissime, deinde sparsius fulvo-strigosus, diametro ad apicem 1.7 mm., basin versus usque ad 2.5 mm. aucto, internodiis 8–12 mm. longis. Folia petiolo 7–10 mm. longo, breviter sed densissime fulvo-strigoso instructa; lamina lanceolata, 7–11 cm. longa et 2–3.3 cm. lata, apice acuta vel acuminata, basi acuta vel subacuta, margine dense strigosa, supra costa quae basin versus est dense fulvo-strigosa excepta glaberrima, subtus costa nervisque

densissime, venulis principalibus sparsius strigosa, utrimque opaca, sicc. supra saturate brunnea, subtus fusca, nervis utroque latere costae 5 vel 6. Stipulae oblongae, 1.7 cm. longae et 5.5 mm. latae, apice acutae, extus pilis brevibus sparsae, margine ciliatae, sicc. brunneae, costa praesertim basin versus prominente, ante folia deciduae. Inflorescentia subsessilis, circ. 6-flora, basi bracteis linearibus 5 mm. longis et 0.5 mm. latis instructa. Flores pedicello circ. 10 mm. longo, breviter sed densissime fulvo-strigoso elati. Ovarium cylindricum, 8 mm. longum et 1 mm. diam., ut pedicellus densissime fulvo-strigosum. Calycis lobi lineares, 11 mm. longi et 1.5–1.8 mm. lati, caudato-acuminati, extus intusque pilis brevibus sparse, margine dense strigosi, 3- vel 5-nervii. Corolla colore ignoto, 2 cm. longa, extus breviter strigosa; tubus 14 mm. longus et 4.5 mm. diam.; lobi ovati, 5.5 mm. longi et 3.5 mm. lati, acuti. Stamina 9 mm. longa; filamenta 3 mm.; antherae 6 mm. longae, connectivo in appendicem anguste triangularem, 1.3 mm. longam exeunte. Stylus basi paulum incrassatus; receptaculum pollinis 2.5 mm. longum et basi 0.8 mm. diam.; stigmata subulata 1.5 mm. longa. Fructus nondum notus.

Habitat terrae Borneënsis partem centralem.

CENTRAL BORNEO: s.l., *Jaheri* (Exped. Nieuwenhuis) *754* (L, typus).

Acranthera Nieuwenhuisii comes very near to *A. Hallierii* Val., from which it differs in the greater length of the internodes, the lanceolate, entirely green, less conspicuously ciliated leaves, the oblong stipules, the linear calyx-lobes and the greater length of the points in which the connectives are drawn out. Both species are in general aspect not unlike some species belonging to the subgenus *Dichroanthes*, namely *A. variegata* Merr. and *A. aurantiaca* Val. ex Brem., from which they are, of course, easily distinguishable by the eciliolate anthers and the mitriform *receptaculum pollinis*, and probably also by the colour of the corolla. It is true that the colour of the corolla in *A. Nieuwenhuisii* is unknown, but as that of *A. Hallierii* is said to be white, there is good reason to assume that the flowers of *A. Nieuwenhuisii* too will be white.

31. **Acranthera Hallierii** Val. in Ic. Bog. 4: 183, t. 356. 1913.

Herba subrosularis. Caulis ad apicem pilis satis longis strigosus, basin versus glabrescens, diametro ad apicem 2 mm., basin versus usque ad 3.5 mm. aucto, internodiis circ. 5 mm. longis. Folia petiolo 0.5–2.5 cm. longo, primum dense, deinde sparsius strigoso instructa; lamina elliptico-lanceolata vel obovata, 6.5–11 cm. longa et 2.5–4.5 cm. lata, apice acuta vel subacuminata, basi acuta vel subtruncata et prope petiolum subito contracta, margine densissime et satis longe strigosa, supra costa quae basin versus est sparse strigosa excepta glaberrima, subtus costa nervisque densissime, venulis sparsius et brevius strigosa, utrimque opaca, variegata, sicc. supra saturate brunnea, subtus fusca, nervis utroque latere costae 6 vel 7. Stipulae ovatae, 13 mm. longae et 6 mm. latae, obtusae, extus sparse strigosae, costa prominula, deciduae. Inflorescentia subsessilis, e floribus 2–6 composita; bracteae angustae, vix conspicuae. Flores pedicello usque ad 1.5 cm. longo, pilis brevibus dense griseo-strigoso elati. Ovarium cylindricum, 5 mm. longum et 1 mm. diam., ut pedicellus dense griseo-strigosum. Calycis lobi lanceolati, 8.5 mm. longi et 1.7–2 mm. lati.

acuti, extus sparse, costa et margine densius strigosi. Corolla alba, 17 mm. longa, extus pilis brevibus dense strigosa; tubus 11 mm. longus et 5 mm. diam.; lobi ovato-triangulares, 6–7 mm. longi et 3 mm. lati. Stamina 10 mm. longa; filamenta 3 mm.; antherae 7 mm. longae, connectivo in appendicem vix 0.5 mm. longam producto. Receptaculum pollinis 2 mm. longum et basi 0.8 mm. diam.; stigmata subulata 0.5 mm. longa. Fructus nondum notus.

Habitat terrae Borneënsis partem centralem.

CENTRAL BORNEO: s.l., *Amdjah* (Exped. *Nieuwenhuis*) *310* (L, exemplum typi).

The figure and description given by Valeton of the *receptaculum pollinis* are wrong, and the white patches of the leaves are neither mentioned nor shown.

32. **Acranthera atropella** Stapf in Trans. Linn. Soc. Bot. II, 4: 173. 1894. — British North Borneo.

Specimens of this species were collected by Low & Haviland on the slopes of Mt. Kinabalu at an altitude of 1500–1800 m. It reaches, therefore, a greater height than any of its allies. Its position in the subgenus *Mitracme* is not yet fully assured, for Stapf describes the *receptaculum pollinis*, which he too confuses with the stigma, as capitate, but as his description in other respects closely resembles those given above of *A. Nieuwenhuisii* and *A. Hallierii*, I have little doubt that its *receptaculum pollinis* is in reality mitriform. The corolla has been described as "obscure cyaneum," but this may be the colour it assumes in the herbarium: the flowers of the other Bornean species are, at least in the living state, never blue. The similarity between this species and *A. Hallierii* has been noticed already by Valeton, who, however, gave an erroneous interpretation of the structure of their inflorescences (cf. Ic. Bog. 4: 182. 1913). He thought that the flowers were in reality axillary, the umbellate arrangement being simulated by the shortness of the upper internodes, but in *A. Hallierii* the flowers are by no means subtended by ordinary leaves, but by minute bracts, and the inflorescence is doubtless cymoso-umbellate. Stapf describes the flowers of *A. atropella* as "pseudo-umbellate," but this means probably that the flowers do not open centripetally, as in a true umbel, but centrifugally. As he says that the inflorescence is sessile and at the base surrounded by the two upper pairs of leaves with their stipules, the possibility that the flowers might be axillary, seems excluded. True umbels are probably unknown in the whole family; when the flowers are fascicled at the top of a common peduncle, the arrangement always seems to be entirely or partly cymose.

Stapf mentions a minute white punctation of the upper side of the leaves caused by collapsed cells. This punctation has also been observed in *A. Nieuwenhuisii* and in the three species belonging to the next subgenus.

SUBGENUS I. ATHROOPHLEPS BREM. SUBGEN. NOV.

Herbae ascendentes vel suberectae. Folia supra sub lente cellulis collapsis albo-punctata, venulis ad nervos plus minusve perpendicularibus

et valde approximatis utrimque transverse striata. Stipulae oblongae vel obovatae, obtusae, internodiis superioribus subaequilongae, dense reticulatae, plerumque deciduae. Inflorescentia terminalis. Flores sessiles vel subsessiles. Ovarium turbinatum. Corolla alba, tubo anguste campanulato. Stamina filamentis glabris et liberis, quam antheris multo brevioribus, antheris eciliolatis, connectivo in appendicem filiformem producto. Discus inconspicuus. Stylus cylindricus; receptaculum pollinis annulare. Fructus cylindricus.

Species adhuc notae tres terrae Borneënsis partem septentrionalem habitantes. Subgeneris typus: *A. athroophlebia* Brem. n. spec. v. infra.

KEY TO THE SPECIES

Flowers laxly paniculate; bracts deciduous. Leaves, calyx and corolla, apart from the ciliate margin, entirely glabrous. — North Borneo.....33. *A. athroophlebia*
Flowers subcapitate; bracts persistent. Leaves on the underside, at least on the nerves, as well as calyx-lobes and outside of the corolla, pubescent.
Leaves with 6–10 pairs of nerves; midrib and nerves hirto-pubescent on the underside. Stipules early deciduous. — North Borneo.....34. *A. capitata*
Leaves with 4–5 pairs of nerves; midrib and nerves strigose on the underside. Stipules subpersistent. — North Borneo.....35. *A. Ruttenii*

33. **Acranthera athroophlebia** Brem. n. spec.; typus: *J. & M. S. Clemens 30616* (L).

Herba suberecta, usque ad 90 cm. alta. Caulis sulcis interdum primum pulverulentus, mox totus glabrescens, diametro ad apicem 5 mm., basin versus usque ad 10 mm. aucto, internodiis superioribus 3–7 cm. longis, sicc. nigrescens. Folia petiolo 4–5 cm. longo, glabro, sicc. nigrescente instructa; lamina oblanceolata vel obovata, 16–29 cm. longa et 4.7–10 cm. lata, apice acuta vel sensim et vix conspicue acuminata, basi cuneata, margine parce sed longius ciliata, ceterum glabra, utrimque opaca, sicc. supra nigrescens, subtus fuscescens, nervis utroque latere costae 6–8. Stipulae oblongae, 2–3 cm. longae et 1–1.5 cm. latae, apice rotundatae, interdum tamen breviter mucronatae, costa prominente, extus glabrae, deciduae. Inflorescentia nunc subsessilis nunc pedunculo usque ad 3 cm. longo elata, laxe paniculiformis; rachis ad anthesin circ. 7 cm. longa, postea usque ad 18 cm. elongata; rachis ramulique glabri, sicc. nigrescentes; ramuli ultimi monochasiales, post anthesin usque ad 5 cm. elongati, multiflori; bracteae ovatae, concavae et basi saccatae, plerumque circ. 1 cm. longae, margine dense ciliatae, ceterum glabrae, sicc. fuscescentes, ad anthesin deciduae. Flores subsessiles. Ovarium 5 mm. longum et 2.7 mm. diam., glabrum. Calycis lobi oblongi, 7.5 mm. longi et 2.5 mm. lati, acuti, margine ciliati, ceterum glabri, nervis circ. 7 quorum 3 fortiores instructi. Corolla margine ciliata, ceterum glabra; tubus 9 mm. longus et 4 mm. diam.; lobi ovati, 4 mm. longi et 3 mm. lati, acuti, dimidio superiore reflexo et reduplicato. Stamina 7 mm. longa; filamenta 1.8 mm.; antherae 5.2 mm. longae, connectivo carinato in appendicem contortam, 1.7 mm. longam producto. Stylus supra receptaculum pollinis obtusus. Fructus late cylindricus, 15 mm. longus et 4 mm. diam., glaber. Semina reticulata.

Habitat terrae Borneënsis partem septentrionalem.

British North Borneo: Mt. Kinabalu, Penibukan, alt. 1200 m., *J. & M. S. Clemens 30616* (L, typus, AA, dupl. typi, BZ, tripl. typi); *id. 31308* (AA), *32136* (L, AA).

In the colour which it assumes in drying, and in the presence of collapsed cells on the upper side of the leaves, this species resembles *A. atropella* Stapf, from which it differs, however, conspicuously in its almost complete glabrescence, in the larger size of the leaves and stipules, and above all in the paniculately arranged, subsessile flowers. As Stapf states that in his species the venules are indistinct, the possibility that it might belong to the subgenus *Athroophleps*, need not be taken seriously.

The differences between this species and the two next ones have been summarized in the key.

34. **Acranthera capitata** Val. in Ic. Bog. 4: 275, t. 391. 1914.

Herba ascendens, circ. 30 cm. alta, post anthesin decumbens et ex axillis inferioribus innovationes emittens. Caulis primum pilis rufo-fuscis breviter pubescens, deinde glabrescens, diametro ad apicem 2.5 mm., basin versus usque ad 7 mm. aucto, internodiis superioribus 0.5–3 cm. longis, inferioribus usque ad 7 cm. longis, sicc. fuscescens. Folia petiolo 2.5–7 cm. longo, dense pubescente, sicc. olivaceo-brunneo instructa; lamina elliptica vel saepius obovata, 13–25 cm. longa et 6.5–9 cm. lata, subobtusa vel vix conspicue acuminata, basi acuta vel saepius cuneata, margine dense ciliata, supra primum pubescens, mox glabrescens, subtus costa nervis nec non venulis fortioribus dense hirto-pubescens, ceterum subglabra, utrimque opaca, sicc. supra saturate olivacea, subtus fusca, nervis utroque latere costae 6–10. Stipulae ellipticae vel obovatae, 12–15 mm. longae et 8–12 mm. latae, apice rotundatae, costa basin versus prominente, extus primum satis dense, costa densius pubescentes, margine dense ciliatae, deciduae. Inflorescentia breviter pedunculata, plus minusve capituliformis, re vera pentachotome corymbosa, ramulis brevissimis; pedunculus dense hirto-pubescens, 1–2 cm. longus, recurvatus; bracteae exteriores ovatae, 12 mm. longae et 7 mm. latae; aliae gradatim minores et praesertim angustiores; omnes sicc. fuscescentes, extus sparse, intus densius pubescentes, margine dense ciliatae, ad anthesin persistentes. Flores sessiles. Ovarium 3 mm. longum et 1.2 mm. diam., dense griseo-pubescens. Calycis lobi lanceolati, 5 mm. longi et 1.8 mm. lati, acuti, margine ciliati, extus intusque pubescentes, nervis 3 vel 5 quorum 3 fortiores instructi. Corolla extus parce pubescens, margine ciliata; tubus 7 mm. longus et 4 mm. diam.; lobi 2.8 mm. longi et 1.9 mm. lati, acuti. Stamina 6.7 mm. longa; filamenta 1.6 mm.; antherae 5.2 mm. longae, connectivo vix conspicue carinato in appendicem rectam, 0.9 mm. longam producto. Fructus glaber dictus, nondum plene maturus 10 mm. longus et 2 mm. diam.

Habitat terrae Borneënsis partem septentrionalem.

BORNEO: Eastern and Southern Division, Tidoong: Ulu Sebulu, *Amdjah 634* (L, dupl. typi); S. Tulit, *id. 664* (L).

According to Valeton l.c. the flowers of *Amdjah 664* should be violet, those of the other specimens white; maybe the colour changes before the corolla is shed.

The differences between this species and *A. Ruttenii* Brem. are given in the key. Although rather different in aspect, they are doubtless nearly related.

35. **Acranthera Ruttenii** Brem. n. spec.; typus: *Rutten 642* (U).

Herba suberecta, circ. 60 cm. alta, post anthesin decumbens et ex axillis inferioribus innovationes emittens. Caulis primum pilis longis strigosus, deinde glabrescens, diametro ad apicem 1.5 mm., basin versus usque ad 3 mm. aucto, internodiis superioribus 0.8–1.5 cm. longis, inferioribus usque ad 11.5 cm. longis, sicc. saturate olivaceus. Folia petiolo 1.5–2.5 cm. longo, dense strigoso-villoso, sicc. olivaceo instructa; lamina lanceolata vel obovata, 8–11 cm. longa et 4–5 cm. lata, apice acuminata, basi contracta, margine dense ciliata, supra primum sparse villosa, deinde glabrescens, subtus costa nervis nec non venulis fortioribus dense strigosa, ceterum glabra, utrimque opaca, sicc. supra olivacea, subtus dilute fusca, nervis utroque latere costae 4 vel 5. Stipulae oblongo-ellipticae, 13–15 mm. longae et 8–9 mm. latae, apice truncatae, costa basin versus prominente, extus primum praesertim costa parce villosae, margine primum densius ciliatae, subpersistentes. Inflorescentia pedunculata, capituliformis; pedunculus dense griseo-pubescens, circ. 1 cm. longus, patens; bracteae exteriores ovatae, 13 mm. longae et 7.5 mm. latae; aliae angustiores; omnes sicc. fuscescentes, extus sparse et intus densius pubescentes, margine dense ciliatae, ad anthesin persistentes. Flores sessiles. Ovarium 4 mm. longum et 2.2 mm. diam., dense griseo-pubescens. Calycis lobi lineari-lanceolati vel lineari-oblongi, 7.5 mm. longi et 1.8–2.2 mm. lati, acuti, margine ciliati, extus vix conspicue, intus densius pubescentes, nervis circ. 5 quorum 3 fortiores instructi. Corolla extus sericeo-villosa, margine ciliata; tubus 7 mm. longus et 3 mm. diam.; lobi 2.7 mm. longi et 2 mm. lati, acuti. Stamina 6.5 mm. longa; filamenta 1 mm.; antherae 5.5 mm. longae, connectivo vix conspicue carinato in appendicem rectam, 0.7 mm. longam producto. Fructus nondum notus.

Habitat terrae Borneënsis partem septentrianalem.

Borneo: Eastern and Southern Division: Bulongan, S. Sadjau, 117° 40′ E.long., 2° 40′ N.lat., *Rutten 642* (U, typus).

INDEX SPECIERUM

21. *abbreviata* Val. in Ic. Bog. 4: 181, t. 355. 1913 — West Borneo.
1. *anamallica* Bedd., Ic. Pl. Ind. Or. 1: 5, t. 23. 1874 — Indian Peninsula.
33. *athroophlebia* Brem. n. spec. — North Borneo.
32. *atropella* Stapf in Trans. Linn. Soc. Bot. II, 4: 173. 1894 — North Borneo.
16. *aurantiaca* Val. ex Brem. n. spec. — West Borneo.
20. *axilliflora* Val. in Bot. Jahrb. 44: 550. 1910 — South-east Borneo.
12. *bullata* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937 — West Borneo.
34. *capitata* Val. in Ic. Bog. 4: 275, t. 391. 1914 — North Borneo.
3. **ceylanica* Arn. ex Meisn., Pl. Vasc. Gen. 2: 115. 1838 — Ceylon.
didymocarpus H. H. W. Pearson ex Ridl. in Jour. Fed. Mal. States Mus. 4: 32. 1909, in syn.: *Gardenia didymocarpus* Ridl.
24. *Endertii* Brem. n. spec. — East Borneo.
27. *frutescens* Val. in Bot. Jahrb. 44: 551. 1910 — Borneo, North Borneo excepted.
2. *grandiflora* Bedd., Ic. Pl. Ind. Or. 1: 5, t. 25, 1874 — Indian Peninsula.
Griffithii Hook.f., Fl. Brit. Ind. 3: 92. 1880 = *Asemanthia Griffithii* (Hook.f.) Brem. n. comb.

31. *Hallierii* Val. in Ic. Bog. 4: 183, t. 356. 1913 — Central Borneo.
22. *hirtistipula* Val. in Ic. Bog. 4: 277, t. 392. 1914 — Central Borneo.
11. *involucrata* Val. in Ic. Bog. 4: 279, t. 393. 1914 — West Borneo.
13. *Johannis-Winkleri* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 285. 1937 — West Borneo.
29. *lanceolata* Val. in Ic. Bog. 4: 281, t. 394. 1914 — Central and West Borneo.
8. *longipes* Merr. in Papers Mich. Acad. Sci. 19: 194. 1934 — East Sumatra.
longipes Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 284. 1937, homonym. illeg. = *longipetiolata*.
19. *longipetiolata* Merr. ex Brem. n. nom. (*longipes* Merr. 1937, non 1934) — West Borneo.
23. *maculata* Val. in Ic. Bog. 4: 283, t. 395. 1914 — Central Borneo.
Maingayi Hook.f., Fl. Brit. Ind. 3: 92. 1880=*Asemanthia Maingayi* (Hook.f.) Ridl. in Kew Bull. 1939: 600. 1939.
18. *megaphylla* Brem. n. spec. — Borneo.
14. *monantha* Val. in Bot. Jahrb. 48: 111. 1912 — North (?) Borneo.
multiflora Val. in Ic. Bog. 4: 285, t. 396. 1914, probabiliter=*frutescens*.
multinervia Val. in sched. cf. *bullata*.
mutabilis Hemsl. in Jour. Bot. 25: 204. 1887 (Mussaenda mutabilis Hemsl. in Hook., Ic. Pl. t. 1718. 1887)=*Asemanthia Maingayi* (Hook.f.) Ridl. in Kew Bull. 1939: 600. 1939.
mutica Val. in sched. cf. *simalurensis*.
30. *Nieuwenhuisii* Val. ex Brem. n. spec. — Central Borneo.
7. *ophiorrhizoides* Val. in Ic. Bog. 4: 287, t. 397. 1914 — North Borneo.
25. *parviflora* Val. in Ic. Bog. 4: 289, t. 398. 1914 — West Borneo.
28. *philippinensis* Merr. in Philip. Jour. Sci. Bot. 8: 32. 1913 — Mindanao.
35. *Ruttenii* Brem. n. spec. — North Borneo.
17. *salmonea* Brem. n. spec. — East Borneo.
5. *siamensis* (Kerr) Brem. n. comb. (Psilobium siamense Kerr in Hook., Ic. Pl. t. 3332. 1937) — Peninsular Siam.
6. *siliquosa* Brem. n. spec. — East Borneo.
10. *simalurensis* Brem. n. spec. — Simalur.
strigosa Val. in Ic. Bog. 4: 291, t. 399. 1914, species incertae sedis nondum visa — Central Borneo.
4. *tomentosa* R.Br. ex Hook.f., Fl. Brit. Ind. 3: 92. 1880 — Assam.
uniflora (Wall. ex G. Don) Kurz in Jour. As. Soc. Bengal 41 (2): 312. 1872 (Mussaenda uniflora Wall. ex G. Don)=*Aphaenandra uniflora* (Wall. ex G. Don) Brem. in Blumea, Suppl. 1: 121. 1937.
15. *variegata* Merr. in Mitt. Inst. Allg. Bot. Hamburg 7: 285. 1937 — West Borneo.
26. *velutinervia* Brem. n. spec. — North Borneo.
9. *Yatesii* Merr. in Papers Mich. Acad. Sci. 19: 194. 1934 — East Sumatra.
zeylanica Arn. in Ann. Nat. Hist. 3: 21. 1839=*ceylanica*.

ZEIST,
HOLLAND.

TROPICAL FERN HOSTS OF RUST FUNGI

J. H. Faull

Rusts on ferns are referred in current literature on mycology and plant pathology to the definitive genera *Hyalopsora*, *Milesia*, *Uredinopsis*, *Desmella* and *Puccinia* and in a few instances to the imperfect genus *Uredo*. The complete life-histories of many species of the first three have already been determined experimentally; in all cases they have proved to be heteroecious, with species of *Abies* serving exclusively as their aecial hosts. So it may quite safely be assumed that the same pattern is potentially true of all the other species of *Hyalopsora*, *Milesia* and *Uredinopsis*. Regarding *Desmella*, uredia and telia only are known; and as they are so unlike those of the three foregoing genera, the identities of hosts that can carry the aecial stages of *Desmella* rusts are not even conjectured. It is a strange genus, taxonomically standing quite apart from the other fern-restricted genera. Thus far it has been reported from the American tropics only. Among the remaining fern rusts, a single species of *Puccinia* has been described, though solely with respect to its uredia and telia. Finally, as to the *Uredo* fern rusts, they can with reasonable certainty be recognized as uredo stages of one or other of the five definitive genera. Indeed, not a few of the named species of these genera have been described from the uredo stage and without knowledge of telia. Although technically open to some objections, this practice does offer advantages if used with discretion.

With possible exceptions of Australia and Tasmania, fern rusts are world-wide in distribution. Of course, locally within any extensive region there may be limiting factors, such, for example, as continuously high day and night temperatures. Otherwise they are likely to be found wherever ferns grow and on a surprisingly large number of specific hosts. Naturally, where those that are *Abies*-infecting occur beyond the ranges of *Abies*, they can be perpetuated solely by seasonal transmission from affected ferns to plants of identical kind or of species that are likewise susceptible. Indeed, as the southern distributional limits of *Abies* are approached, this method becomes increasingly frequent, even in those rust species that lack amphispores. Of course this method is possible for amphispore-producing rusts in any latitude, but otherwise only wherever there is a sufficiently close overlapping of successive seasonal crops of fronds, that is, a succession within the vital life-span of ordinary urediospores. It may not be superfluous to recall to mind here that the most southerly ranges of existing *Abies*, though well within the tropics in the western hemisphere and reaching to the tropics in the eastern, fall far short of the equator.

TABLE I

PUBLISHED TROPICAL FERN HOSTS, THEIR RUSTS AND REGIONAL ORIGINS

Fern hosts	Rusts	Regional origins
1. *Adiantum andicola* Liebm.	*Uredinopsis investita* Faull	Guatemala†
2. *Anemia fulva* (Cav.) Sw.	*Desmella Aneimiae* (Henn.) Syd.	Brazil
3. *Anemia Phyllitidis* (L.) Sw.	*Desmella*	Brazil
4. *Anemia tomentosa* (Sav.) Sw. (*A. cheilanthoides* Kaulf.)	*Desmella Aneimiae* (Henn.) Syd.	Brazil†
5. *Antrophyum lanceolatum* (L.) Kaulf.	*Hyalopsora Polytaenii* (KCT) Cummins	Dominican Republic†; Porto Rico
6. *Blechnum occidentale* L.	*Milesia australis* Arthur	Colombia†; Costa Rica; Porto Rico
7. *Blechnum unilaterale* Sw. [*B. blechnoides* (Lagerh.) C.Chr.]	*Uredinopsis Mayoriana* Diet.	Colombia†
8. *Blechnum volubile* Kaulf.	*Desmella* (*Uredo blechnicola* Henn.)	Brazil†
9. *Cheilanthes pyramidalis* Fée	*Uredinopsis glabra* Faull	Mexico
10. *Coniogramme fraxinea* (Don) Diels	*Milesia Coniogrammes* (Hirats. f.) n. comb. (*Milesina Coniogrammes* Hirats. f.)	Formosa
11. *Cystopteris fragilis* (L.) Bernh.	*Uredinopsis glabra* Faull	Mexico†
12. *Dennstaedtia rubiginosa* (Kaulf.) Moore	*Desmella*	Porto Rico
13. *Dennstaedtia rubiginosa* (Kaulf.) Moore	*Milesia Dennstaedtiae* (Diet.) Faull	Colombia†
14. *Dryopteris* sp. [Close to *D. oligocarpa* (H. & B.) Kuntze]	*Milesia andina* Faull	Ecuador†
15. *Dryopteris Clarkei* (Bak.) Kuntze	*Milesia Miyabei* (Kamei) Faull	Formosa
16. *Dryopteris dentata* (Forsk.) C. Chr. [*D. mollis* (Jacq.) Hieron.]	*Desmella*	Porto Rico
17. *Dryopteris patens* (Sw.) Kuntze	*Milesia consimilis* Arthur	Jamaica†
18. *Dryopteris Poiteana* (Bory) Urban	*Desmella*	Porto Rico
19. *Dryopteris Poiteana* f. *prolifera*	*Desmella*	Venezuela

TABLE I (*Continued*)

Fern hosts	Rusts	Regional origins
20. *Dryopteris quadripinnata* Hayata	*Milesia carpatica* var. *erythrosora* Faull [*Milesina erythrosora* (Faull) Hirats. f.]	Formosa
21. *Dryopteris tetragona* (Sw.) Urban	*Desmella*	Porto Rico
22. *Dryopteris tetragona* var. *guadalupensis* C.Chr.	*Desmella*	Venezuela
23. *Elaphoglossum* sp.	*Hyalopsora obovata* (Arthur) Cummins	Colombia
24. *Elaphoglossum latifolium* (Sw.) J. Sm.	*Hyalopsora obovata* (Arthur) Cummins	Jamaica†
25. *Lygodium micans* Sturm (*Lygodium* sp.)	*Uredo* (*Milesina Lygodii* Syd.)	Br. Guiana
26. *Lygodium polymorphum* (Cav.) HBK	*Puccinia Lygodii* (Hariot) Arthur	Brazil†; San Salvador; Trinidad; Venezuela
27. *Lygodium volubile* Sw.	*Uredo*	Brazil
28. *Nephrolepis cordifolia* (L.) Presl	*Milesia philippinensis* (Syd.) n. comb. (*Milesia tenuis* Faull)	Philippine Islands†
29. *Nephrolepis pendula* (Raddi) J. Sm.	*Milesia columbiensis* (Diet.) Arthur	Colombia†
30. *Nephrolepis rivularis* (Vahl) Mett.	*Milesia insularis* Faull	Porto Rico†
31. *Onychium japonicum* (Thunb.) Kunze (*Cryptogramme japonica* Prantl)	*Milesia Cryptogrammes* (Diet.) n. comb. [*Milesina Cryptogrammes* (Diet.) Hirats. f.]	Philippine Islands
32. *Pellaea cardiomorpha* Weath.	*Uredinopsis glabra* Faull	Mexico
33. *Pellaea ternifolia* (Cav.) Link	*Hyalopsora Cheilanthis* (Peck) Arthur	Ecuador
34. *Pellaea viridis* (Forsk.) Prantl [*Pellaea hastata* (Thunb.) Prantl]	*Milesia nervisequa* (von Thümen) Faull	Madagascar
35. *Pityrogramma calomelanos* (L.) Link	*Desmella*	Ecuador†; Venezuela
36. "*Polypodiacea* sp."	*Desmella*	Ecuador
37. *Polypodium arisanense* Hayata	*Milesia Hashiokai* (Hirats. f.) n. comb. (*Milesina Hashiokai* Hirats. f.)	Formosa†
38. *Polystichum amabile* (Bl.) J. Sm.	*Milesia arisanensis* (Hirats. f.) n. comb. (*Milesina arisanense* Hirats. f.)	Formosa†

TABLE I (*Continued*)

Fern hosts	Rusts	Regional origins
39. *Pteridium aquilinum* (L.) Kuhn, including varieties and marginal species	*Uredinopsis macrosperma* (Cooke) Magn.	Brazil; Colombia; Cuba; Guatemala; Honduras; Jamaica; Mexico; Panama; Venezuela; Belgian Congo†
40. *Pteridium aquilinum* var. *decompositum* (Gaud.) Tryon	*Uredinopsis aspera* Faull	Hawaii
41. *Pteridium aquilinum* var. *Wightianum* (Agardh) Tryon	*Uredinopsis Hashiokai* Hirats. f.	Formosa†

†Where type was collected.

Not much collecting of fern rusts has been done in the tropics. Yet there is a considerable accumulation from mainly incidental collecting over the years. These are listed above in Table I, and it is quite an impressive compilation. But my own limited, yet intensive collectings in the tropics of North America, supplemented by occasional contributions from correspondents and a few gleanings from fern collections in the Gray Herbarium of Harvard University, are sufficient to show that the number of known fern hosts is probably a small representation of fern species that, in one region or another, carry rust fungi. Table II presents new acquisitions obtained by me in the ways indicated above. Among these are unpublished collecting records of a few species listed in Table I; they are marked with an asterisk (*).

One of the reasons for publishing these lists before detailed studies have been completed on them is to call the attention of collectors in the tropics to a seemingly passed-by group of rust hosts. They will also serve to indicate that our knowledge of fern and fir rusts is far from complete. But now at least enough materials and sources of supply are available to justify more adequate taxonomic review and a wider range of other investigations.

TABLE II

NEW RECORDS FOR TROPICAL FERN HOSTS OF RUST FUNGI

Fern hosts	Rusts	Regional origins
A. Fam. Ophioglossaceae		
1. *Botrychium virginianum* (L.) Sw.	*Hyalopsora*	Guatemala
B. Fam. Schizaeaceae		
2. *Anemia hirsuta* (L.) Sw.	*Desmella*	Jamaica; Mexico
3. *Anemia hirsuta* (L.) Sw.	*Milesia*	Jamaica; Mexico
4. *Lygodium heterodoxum* Kunze	*Uredo*	Guatemala
C. Fam. Gleicheniaceae (?)		
5. *Gleichenia* sp. (?)	*Milesia*	New Guinea
D. Fam. Cyatheaceae		
6. *Cyathea* sp.	*Hyalopsora*	New Guinea
7. *Cyathea fulva* (M. & G.) Fée	*Milesia*	Mexico
8. *Cyathea Harrisii* Underw.	*Milesia*	Jamaica
9. *Cyathea mexicana* Schl. & Cham.	*Milesia*	Guatemala
E. Fam. Polypodiaceae		
10. *Adiantum Capillus-veneris* L.	*Hyalopsora*	Mexico
11. *Adiantum latifolium* Lam.	*Desmella*	Trinidad
12. *Adiantum subcordatum* Sw.	*Hyalopsora*	Brazil
13. *Anogramma chaerophylla* (Desv.) Link	*Hyalopsora*	Mexico
14. *Anogramma chaerophylla* (Desv.) Link	*Uredinopsis*	Mexico
15. *Asplenium malayo-alpinum* Holtt.	*Milesia*	New Guinea
16. *Asplenium monanthes* L.	*Hyalopsora*	Guatemala; Mexico
17. *Asplenium monanthes* var. *Galeotti* (Fée) Hieron.	*Hyalopsora*	Mexico
18. *Athyrium* sp.	*Hyalopsora*	New Guinea
19. *Athyrium Dombei* Desv.	*Uredinopsis*	Guatemala; Mexico
20. *Athyrium paucifrons* C. Chr. (?)	*Milesia*	Mexico
21. *Athyrium Skinneri* Moore	*Hyalopsora*	Mexico
22. *Blechnum* sp.	*Milesia* or *Hyalopsora*	New Guinea
23. *Blechnum fraxineum* Willd.	*Milesia*	Venezuela

TABLE II (*Continued*)

Fern hosts	Rusts	Regional origins
24. *Blechnum occidentale* L.*	*Milesia*	Cuba; Guatemala; Jamaica; Mexico; Panama; Venezuela
25. *Blechnum orientale* L.	*Hyalopsora*	Borneo
26. *Blechnum unilaterale* Sw.	*Milesia*	Mexico
27. *Cheilanthes membranacea* (Davenp.) Maxon	*Uredinopsis*	Mexico
28. *Cheilanthes microphylla* Sw.	*Milesia*	Jamaica
29. *Cheilanthes pyramidalis* Fée	*Hyalopsora*	Mexico
30. *Cheilanthes tenuifolia* (Burm.) Sw.	*Milesia*	New Guinea
31. *Coniogramme fraxinea* (Don) Diels	*Hyalopsora*	China (Lat. 25° N)
32. *Cyclopeltis semicordata* (Sw.) J. Sm.	*Desmella*	Trinidad
33. *Cystopteris fragilis* (L.) Bernh.	*Hyalopsora*	Mexico
34. *Dennstaedtia adiantoides* (H. & B.) Moore	*Milesia*	Cuba
35. *Dennstaedtia cicutaria* (Sw.) Moore	*Milesia*	Mexico
36. *Dennstaedtia dissecta* (Sw.) Moore	*Milesia*	Jamaica
37. *Dennstaedtia exaltata* (Kze.) Hieron.	*Milesia*	Mexico
38. *Dennstaedtia ordinata* (Kaulf.) Moore	*Milesia*	Jamaica
39. *Dennstaedtia rubiginosa* (Kaulf.) Moore*	*Desmella*	Jamaica
40. *Dennstaedtia rubiginosa* (Kaulf.) Moore*	*Milesia*	Guatemala; Jamaica; Panama
41. *Diplazium* sp. (?)	*Hyalopsora*	New Guinea
42. *Diplazium* sp. (?)	*Hyalopsora*	New Guinea
43. *Diplazium crenulatum* O. Liebm.	*Milesia*	Guatemala
44. *Diplazium expansum* Willd.	*Desmella*	Cuba
45. *Dryopteris* sp.	*Milesia*	New Guinea
46. *Dryopteris*, n. sp. (?) acc. to Maxon	*Milesia*	Jamaica
47. *Dryopteris boqueronensis* Hieron. (?)	*Milesia*	Ecuador

TABLE II (*Continued*)

Fern hosts	Rusts	Regional origins
48. *Dryopteris concinna* (Willd.) Kuntze	*Milesia*	Guatemala; Panama
49. *Dryopteris dentata* (Forsk.) C. Chr.	*Milesia*	Panama
50. *Dryopteris diplazioides* (Desv.) Urban	*Milesia*	Ecuador
51. *Dryopteris effusa* (Sw.) Urban	*Milesia*	Jamaica
52. *Dryopteris equestris* (Kunze) C. Chr.	*Milesia*	Guatemala
53. *Dryopteris firma* (Baker) C. Chr.	*Milesia*	Jamaica
54. *Dryopteris heteroclita* (Desv.) C. Chr.	*Milesia*	Jamaica
55. *Dryopteris melanochlaena* C. Chr.	*Milesia*	Guatemala
56. *Dryopteris navarrensis* Christ	*Milesia*	Panama
57. *Dryopteris Nockiana* (Jenm.) C. Chr.	*Milesia*	Jamaica
58. *Dryopteris oligocarpa* (H. & B.) Kuntze	*Desmella*	Jamaica
59. *Dryopteris oligocarpa* (H. & B.) Kuntze	*Milesia*	Guatemala; Jamaica; Mexico
60. *Dryopteris opposita* (Vahl) Urban (?)	*Milesia*	Panama
61. *Dryopteris paleacea* (Sw.) C. Chr.	*Milesia*	Guatemala; Mexico
62. *Dryopteris patens* (Sw.) Kuntze*	*Milesia*	Jamaica
63. *Dryopteris patula* (Sw.) Underw. var. *Rossii* C. Chr.	*Milesia*	Mexico
64. *Dryopteris pilosula* (Kl. & Karst.) Hieron. (approaches *D. navarrensis* Christ)	*Hyalopsora*	Guatemala
65. *Dryopteris resinifera* (Desv.) Weatherby	*Desmella*	Mexico
66. *Dryopteris resinifera* (Desv.) Weatherby	*Milesia*	Guatemala
67. *Dryopteris rubigena* Maxon & Morton	*Milesia*	Guatemala
68. *Dryopteris rudis* (Kze.) C. Chr. (?)	*Milesia*	Guatemala
69. *Dryopteris Sloanii* (Bak.) Kuntze (*D. oligophylla* Maxon)	*Milesia*	Jamaica

TABLE II (*Continued*)

Fern hosts	Rusts	Regional origins
70. *Dryopteris Sprengelii* (Kaulf.) Kuntze	*Milesia*	Jamaica
71. *Dryopteris tetragona* (Sw.) Urban*	*Desmella*	Jamaica
72. *Elaphoglossum lingua* (Raddi) Brack.	*Hyalopsora*	Jamaica
73. *Elaphoglossum Pringlei* (Davenp.) C. Chr.	*Milesia*	Mexico
74. *Hemionitis palmata* L.	*Milesia*	Jamaica
75. *Odontosoria Jenmanii* Maxon	*Milesia*	Jamaica
76. *Pellaea cardiomorpha* Weatherby	*Hyalopsora*	Mexico
77. *Pityrogramma sulphurea* (Sw.) Maxon	*Desmella*	Jamaica
78. *Polybotrya osmundacea* HBK	*Milesia*	Jamaica
79. *Polypodium aureum* L.	*Desmella*	Panama
80. *Polypodium ellipsoideum* Fée	*Hyalopsora*	Guatemala; Mexico
81. *Polypodium fissidens* Maxon	*Hyalopsora*	Guatemala
82. *Polypodium fissidens* Maxon	*Milesia*	Guatemala
83. *Polypodium loriceum* L.	*Desmella*	Jamaica
84. *Polypodium Martensii* Mett.	*Hyalopsora*	Guatemala; Mexico
85. *Polypodium plesiosorum* Kunze	*Uredinopsis*	Guatemala; Mexico
86. *Polypodium Veitchii* Bak. var. *glaucopsis* (Franch.) Ching	*Hyalopsora*	China (Lat. 26° N)
87. *Polystichum rachichlaena* Fée	*Milesia*	Guatemala
88. *Pteris longifolia* L.	*Milesia*	Jamaica
89. *Pteris longifolia* L.	*Desmella*	Jamaica
90. *Pteris quadriaurita* Retz.	*Milesia*	Panama
91. *Pteris quadriaurita* Retz.	*Desmella*	Jamaica
92. *Tectaria irregularis* (Pr.) Copeland (?)	*Milesia*	New Guinea
93. *Woodsia mollis* (Kaulf.) J. Sm.	*Hyalopsora*	Mexico

SUMMARY AND COMMENTS

1. Rusts are recorded for the first time as occurring in the Ophioglossaceae and Cyatheaceae. To these may possibly be added the Gleicheniaceae.

2. *Hyalopsora* rusts are recorded for the first time as occurring in the Ophioglossaceae and Cyatheaceae.

3. *Milesia* rusts are correctly recorded for the first time as occurring in the Schizaeaceae and Cyatheaceae. To these may possibly be added the Gleicheniaceae.

4. Species of the following fern genera, found growing within the tropics, are recorded in this paper as:

(a) hosts for DESMELLA rusts: **Adiantum** (1), *Anemia* (4), *Blechnum* (1), **Cyclopeltis** (1), *Dennstaedtia* (1), **Diplazium** (1), *Dryopteris* (5), *Pityrogramma* (2), "Polypodiacea" (1), **Polypodium** (2), **Pteris** (2);

(b) hosts for HYALOPSORA rusts: **Adiantum** (2), **Anogramma** (1), *Antrophyum* (1), **Asplenium** (1), **Athyrium** (2), **Blechnum** (1), **Botrychium** (1), **Cheilanthes** (1), **Coniogramme** (1), **Cyathea** (1), **Cystopteris** (1), **Diplazium** (2), **Dryopteris** (1), *Elaphoglossum* (2), *Pellaea* (2), **Polypodium** (4), **Woodsia** (1);

(c) hosts for MILESIA rusts: **Anemia** (1), **Asplenium** (1), **Athyrium** (1), *Blechnum* (4), **Cheilanthes** (2), *Coniogramme* (1), **Cyathea** (3), *Dennstaedtia* (6), **Diplazium** (1), *Dryopteris* (26), **Elaphoglossum** (1), **Gleichenia** ? (1), **Hemionitis** (1), *Nephrolepis* (3), *Onychium* (1), **Odontosoria** (1), *Pellaea* (1), **Polybotryum** (1), *Polypodium* (2), *Polystichum* (2), **Pteris** (2), **Tectaria** (1);

(d) hosts for UREDINOPSIS rusts: *Adiantum* (1), **Anogramma** (1), **Asplenium** (1), **Athyrium** (1), *Blechnum* (1), *Cheilanthes* (2), *Cystopteris* (1), *Pellaea* (1), **Polypodium** (1), *Pteridium* (including under *P. aquilinum* its varieties and marginal species).

The names in **black face** are genera within the tropics recorded for the first time as hosts for rust fungi. The numbers of species reported for each genus are indicated in parentheses.

5. *Desmella* is reported in this paper on 21 fern host species collected within the tropics, *Hyalopsora* on 24 species, *Milesia* on 63 species, *Uredinopsis* on 10 species, *Puccinia* on one species, and *Uredo* on 4 species. The paper lists a total of 109 tropical fern species (exclusive of varieties, etc.) known to be hosts of rust fungi; of these 73 are recorded for the first time.

6. I have found 25 rusted fern host species in Guatemala, 27 in Jamaica, 27 in tropical Mexico and 9 in Panama. Hashioka, in collections made both north and south of the Tropic of Cancer, reported 16 from Formosa (as published by Hiratsuka & Hashioka in their "Uredinales collected in Formosa"). Varieties are not included in any of these numbers, nor are the submarginal species of *Pteridium aquilinum*.

7. According to my experience, rusted ferns in the tropics are rarely found below an elevation of about 2000 feet above sea level. *Uredo* rust on *Lygodium* is exceptional; I collected it at sea level around Puerto Barrios in Guatemala. I could find no fern rusts on Barro Colorado Island, Panama Canal Zone; the greatest elevation on that island is said to be under 550 feet.

8. Much is to be expected from the vast mountainous regions extending eastward from Iran (Persia) to the South China Sea, from which have

come scant collections only, and these from very limited northern areas, probably in reality extratropical, such as around Kunming, Yunnan, China.

9. Comprehensive data based on old and new records embodied in fern rust collections from the tropics are summarized in Table III. This table designates all the relevant fern genera hosts, the numbers of their affected species, the involved rust genera for each fern genus, and the regions in which the collections were made.

TABLE III

FERN RUST HOST GENERA IN THE TROPICS AND THEIR DISTRIBUTION

		Desmella	*Hyalopsora*	*Milesia*	*Uredinopsis*
Adiantum	4[a]	Trinidad 1[a]	Mexico 1; Brazil 1	———	Guatemala 1
Anemia	4	Brazil 3; Jam. 1; Mex. 1	———	Jamaica 1; Mexico 1	———
Anogramma	1	———	Mexico 1	———	Mexico 1
Antrophyum	1	———	Dom. Rep. 1; Porto Rico 1	———	———
Asplenium	2	———	Guatemala 1; Mexico 1	New Guinea 1	———
Athyrium	4	———	Mexico 2; New Guinea 1	Mexico 1	Guatemala 1; Mexico 1
Blechnum	6	Brazil 1	Borneo 1	New Guinea 1[b]; Trop. Am.[c] 1, 1, 3	Colombia 1
Cheilanthes	4	———	Mexico 1	Jamaica 1; New Guinea 1	Mexico 1, 1
Coniogramme	1	———	———	Formosa 1	———
Cyathea	4	———	New Guinea 1	Guatemala 1; Jamaica 1; Mexico 1	———
Cyclopeltis	1	Trinidad 1	———	———	———
Cystopteris	1	———	Mexico 1	———	Mexico 1
Dennstaedtia	6	Jamaica 1; Porto Rico 1	———	Colombia 1; Cuba 1; Guatemala 1; Jamaica 3; Mexico 2; Panama 1	———
Diplazium	4	Cuba 1	New Guinea 2	Guatemala 1	———

[a] The numerals indicate the number of host species involved. Those in black face are new records.

[b] This might be a *Hyalopsora*.

[c] Colombia 2, Costa Rica 1, Cuba 1, Ecuador 1, Guatemala 1, Jamaica 1, Mexico 2, Panama 1, Porto Rico 1, Venezuela 2.

TABLE III (*Continued*)

		Desmella	*Hyalopsora*	*Milesia*	*Uredinopsis*
Dryopteris	29	Jamaica 2; Mexico 1; Porto Rico 3; Venezuela 2	Guatemala 1	Ecuador 1, 2; Formosa 2; Guatemala 8; Jamaica 1, 9; Mexico 3; New Guinea 1; Panama 4	———
Elaphoglossum	4	———	Colombia 1; Jamaica 1, 1	Mexico 1	———
Gleichenia (?)	1	———	———	New Guinea 1	———
Hemionitis	1	———	———	Jamaica 1	———
Lygodium	4[d]	———	———	———	———
Nephrolepis	3	———	———	Colombia 1; Phil. Islands 1; Porto Rico 1	———
Odontosoria	1	———	———	Jamaica 1	———
Onychium	1	———	———	Phil. Islands 1	———
Pellaea	3	———	Ecuador 1; Mexico 1	Madagascar 1	Mexico 1
Pityrogramma	2	Ecuador 1; Jamaica 1; Venezuela 1	———	———	———
Polybotrya	1	———	———	Jamaica 1	———
"*Polypodiacea*"	1	Ecuador 1	———	———	———
Polypodium	7	Jamaica 1; Panama 1	Guatemala 3; Mexico 2	Formosa 1	Guatemala 1; Mexico 1
Polystichum	2	———	———	Formosa 1; Guatemala 1	———
Pteridium		———	———	———	Almost world-wide
Pteris	2	Jamaica 2	———	Jamaica 1; Panama 1	———
Tectaria	1	———	———	New Guinea 1	———
Woodsia	1	———	Mexico 1	———	———

[d] Brazil 2; Br. Guiana 1; Guatemala 1; San Salvador 1; Trinidad 1; Venezuela 1. The rusts involved are referred to the genera *Uredo* and *Puccinia* in Tables I and II.

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SPECIES NOVAE FAGACEARUM SINICARUM

WOON-YOUNG CHUN AND YING TSIANG

THE MATERIAL on which this paper is based is part of an extensive collection made between the winter of 1942 and the summer of 1945 under the direction of the junior author. When the situation in Hongkong, where the Botanical Institute was temporarily stationed, became critical, Professor Tsiang led a part of our staff to northern Kwangtung to contact the main body of the University. The attack on Hongkong commenced while the party was enroute. In the winter of 1942 a Branch Institute was established at Li Yuan Po in southern Hunan, and from this new center, botanical explorations in southern Hunan, northern Kwangtung, and the Shih-Wan-Ta Shan region bordering Kwangtung and Kwangsi continued throughout the four years of the Pacific War.

As a result of unremittent labor under difficulties needless to detail, nearly 10,000 numbers totalling over 100,000 specimens, have been collected. This large collection is now available to specialists and botanical institutions throughout the world.

Pending the reissue of our Journal *Sunyatsenia*, this paper is submitted to the *Journal of the Arnold Arboretum* for publication to mark the resumption of normal relations between our two institutions.

The types of the new species here-in described are preserved in the herbarium of the Botanical Institute, Sun Yatsen University; duplicate types in the herbarium of the Arnold Arboretum.

Lithocarpus Chifui Chun et Tsiang, sp. nov.

Arbor 12 m. alta et trunco (e notis collectoris) ad 75 cm. diametro; ramuli mediocriter robusti teretes glabrati, in sicco fusco-nigri lenticellis paucis magnis discoloribus notati anno secundo vix dissimiles; gemmae terminales solitariae vel aggregatae, proportione parvae, 3–4 mm. longae, subglobosae vel ovoideo-obtusae perulis ovatis breviter acuminatis rubescentibus lucidis dorso carinatis margine ciliolatis obtectae. Folia ut videtur per duos annos persistentia, firme coriacea glaberrima oblongo-lanceolata vel oblongo-oblanceolata, apice late acuta, basi saepe oblique cuneata in petiolum robustum paulo producta rarius fere rotunda et in petiolum abrupte contracta, supra atro-viridia subtus cinereo-viridia (teste collectore) siccitate flavescentia, margine integra saepe late undulata, magnitudine in eodem ramulo satis variabilia, minora plerumque ad 15 m. longa et 5 cm. lata, majora 25 cm. longa et 12 cm. lata, costa media supra valde elevata infra medium canaliculata, basin versus circiter 1.2 mm. lata, costa nervisque subtus distincte elevatis lateralibus a costa angulo 25°–30° ab illa divergentibus utrinsecus 10 vel 11 inter se satis distantibus patenti-curvatis ante marginem vix prominente arcuato-anastomosantibus trabeculis transversis subparallelis sparsis sub lente crebre

foveolato-reticulatis conjunctis; petiolus basi turgidus supra late sulcatus glaber, vix ultra 1.5 cm. longus. Flores ♂ desunt. Flores ♀ (post anthesin) quini-aggregati, unicus tantum maturans, 4 alii abortivi, glomeris inter se distantibus plerisque haud maturatis; lamellae 4–5 concentrices tenues erosae obscure griseo-puberulae. Fructus biennes secus pedunculum validum erectum nigrum parce lenticellatum ad 17 cm. longum proventu in examplo viso 7–8 sessiles contigui unilaterales bifariam divergentes; cupula globosa circiter 2 cm. diametro, stylopodio excepto totam glandem includens, tenuis extus undique griseo-lepidotis, zonis 3–4 concentricis inaequaliter distantibus sinuato-undulatis inferioribus subintegris superioribus lacerato-dentatis triangularibus tenuibus ornata. Glans apice excepta cum cupula concrescens depresse globosa vertice complanata basi rotundata glabra pallida subnitida, longitudinaliter rugulosa pericarpio lignoso 2–2.5 mm. crasso; intus eseptata, semen pentagonum.

KWANGTUNG: Yu Yuen Hsien, Mo-Fung Shan, tree 12 m. tall, $\frac{3}{4}$ m. in diameter, leaves dull green above, gray green beneath, Nov. 19, 1933, *S. P. Ko 53679*.

This new species may be compared with *Lithocarpus megastachya* Hick. et A. Camus from which it is amply distinct by isolated, not ternately coalescent acorns. The pistillate inflorescence of our new species, as deduced from the fruiting state, shows some interesting features. The flowers are clustered in 5's in more or less pentagonal groups, but all those on the under side of the rhachis remain abortive, and of those more advantageously placed in relation to light, only one in each cluster reaches maturity. The individual flowers are contiguous but not confluent. The ripe acorns are alternately juxtaposed in two ranks all facing one direction.

This outstanding species is named after Dr. W. P. Fang, Professor of Botany in the National University of Szechuan in recognition of his exhaustive researches on the flora of Omei Shan, and in appreciation of the cooperative spirit dominating his associations with the authors.

Lithocarpus chrysocoma Chun et Tsiang, sp. nov.

Arbor usque ad 12 m. alta, trunco 50 cm. diametro coma late ovoidea, partibus juvenilibus inflorescentiisque ac fructibus dense et molliter tomentosis, cortice in lamellas irregulares profunde fisso, ramis vix patentibus ramulis robustis angulatis junioribus molliter fulvido-tomentosis cito sordide flavescenti-tomentosis vetustioribus glabrescentibus. Gemmae ovoideae vel rotundatae obtusae, circiter 2 mm. longae, perulis ovalis rubrobrunneis lucidis dorso glabris ceterum pilosis. Folia triennia coriacea, supra olivacea nitida annotina opaca praeter costae partem inferiorem sordide puberulam glaberrima, subtus densissime aureo- in sicco ochraceo-farinosa vel pulverulenti-lepidotula, elliptico- vel lanceolato-oblonga apice abrupte falcatim breviter caudato-acuminata, basi inaequaliter cuneata, margine integerrima subtiliter revoluta, 7–10 cm. longa et 3–4 cm. lata, maxima 16 × 6.5 cm., costa nervisque supra subimpressis subtus elevatis lateralibus in utroque latere 9–10 interdum 12 sursum leviter curvatis ante marginem evanescentibus venulis obliteratis, petiolis molliter sordide tomentosis, supra leviter sulcatis, 1–1.5 mm. longis. Amenta mascula in apicibus ramulorum hornotinorum conspersa et ex axillis foliorum sum-

morum paniculata rhachidibus angulatis dense fulvido-tomentosis 3–9 cm. longis, floribus fasciculatis, perianthii lobis membranaceis rubro-purpurascentibus extus tomentosis ovatis concavis circiter 1 mm. longis, staminibus longe exsertis 1.5–2 mm. longis, filamentis glabris filiformibus, antheris globosis; spicae femineae solitariae in axillis foliorum superiorum aggregatae, 3.5 cm. longae; florum fasciculi ad axem crassiusculam dense tomentosam conspersi sessiles 3–6-flori; flores (juvenales non visi) perulis numerosis arcte imbricatis tomentosis; styli 3 glabri divaricati. Fructus biennes 2–3 aggregati inferne confluentes sessiles turbinato-subglobosi; cupula tenuiter lignosa, circiter 1.5 cm. alta et 2 cm. diametro, extus fulvido-tomentosa intus adpresse sericeo-pilosa; squamae multiseriatae deorsum confluentes apicibus acuminatis liberis falcatis; glans praeter apicem planam vel leviter curvatam medio umbonatam inclusa depresse globosa vel hemisphaerica sericeo-puberula, basi cupula solum concrescens, pericarpio usque 1.8 cm. crasso; stigmatibus deciduis; cicatrix alta convexa circiter 18 mm. lata.

KWANGTUNG: Yu-Yuen Hsien, Ching-Chi Tung, tree 6–8 m. tall, July 1933, *S. P. Ko 52839, 52842, 52992, 52933;* same district, Shang-Yuen Shan, July 1933, *S. P. Ko 53000;* Mo Fung, Nov. 1933, *S. P. Ko 53080;* Yu Yuen Hsien, Chine Chi Tung, Aug. 31, 1935, *Z. S. Chung 10957* (TYPE); same locality, Oct. 1936, *Y. Li 2059.*

KWANGSI: Without data, *No. 5877* (B. I. Herb. *No. 387760*). HUNAN: I-Chang, Mang Shan, tree 7 m. tall, Oct. 1942, *P. H. Liang 83704, 83811, 83853;* same locality, Oct. 1942, *S. H. Chun 2720.*

This new species is easily distinguished from its nearest allies, *L. amygdalifolia* (Skan) Schottky and *L. dealbata* (Hook.f. et Th.) Rehd. by the golden to reddish yellow pulverulent indumentum on the undersurface of the leaves.

Lithocarpus Paihengii Chun et Tsiang, sp. nov.

Arbor ad 12 m. alta trunco 22 cm. diametro cortice cinereo-brunnei in lamellas irregulares fisso; ramuli annotini validi angulati profunde sulcati in sicco nigrescentes hornotini crassissimi cylindrici sordide nigrescentes lenticellis satis conspicuis discoloribus conspersi; gemmae magnae obtuse ovatae, 10–12 mm. longae, perulis exterioribus late ovato-rotundatis flavido- vel fulvo-brunneis glabris interioribus albo-sericeis obtectae. Folia persistentia valde coriacea rigida plana oblongo-lanceolata, 15–20 cm. longa, 5–8 cm. lata, apice subito in acumen latum falcatum acutum breviter acuminata, basi late cuneata plerumque in petiolum quasi-alatum decurrentia, supra intense viridia lucida subtus pallidiora vel albescentia (e collectore) initio dense indumento fulvo-furfuraceo-pulverulento anno secundo saepe plus minus evanescente obtecta, costa media utrinque elevata supra dimidio inferiore sulcata subtus et nervi ochrascentes, nervis utrinsecus 8–10 sub angulo 50° divergentibus obliquis curvatis nonnulla furcatis versus marginem indistincte anastomosantibus; trabeculae transversae subtus tantum tenuiter prominulae; petiolus complanatus, 2.5–3 cm. longus. Fructus biennes in rhachidibus validis nigris lenticellatis 2.5–5 cm. longis 2-vel 3-ni glomeratis glomerulis inferne coalescentibus sessilibus; cupula depresse globosa, tenuiter lignosa, 2–2.5 cm. diametro, ore 10–14 mm. diam., fere totam glandem obvoluta sed basin tantum glandem adhaerens, intus densissime et brevissime albo-tomentosa, squamis conspicuis crassis imbricatis deltoideis apicibus liberis, inferne flavo-cinereo-tomentosis

superne glabrescentibus; glans depresse globosa, 18 mm. lata, 15 mm. alta, castanea nitida minute albido-furfuracea parte superiore detergente plana vel subrotundata apiculata; cicatrix basilaris valde convexa albida rugulosa, 15 mm. diametro; nucula subpentagona, obtuse 5-costata.

HUNAN: I-Chang Hsien, Chin-Chuan Village, Cha Shan, alt. 930 m., tree 6 m. tall, on slope of sparsely wooded ravine, leaves whitish green beneath Sept. 25, 1942, *P. H. Liang 63698;* same locality, tree 12 m. tall, 22 cm. diam., bark gray brown peeling off in plates, young leaves brownish beneath, Sept. 26, 1942, *P. H. Liang 83729.*

This new species is most closely related to *Lithocarpus cleistocarpa* (Seemen) Rehd. et Wilson from which it differs in thicker coriaceous leaves with a fulvous furfuraceous indumentum on the undersurface which persists more or less into the second year, and especially in the very different fruits. In *L. cleistocarpa* the acorn is completely adnate to the cupule excepting the exposed apex, while in this new species, it adheres to the involucre only at the base.

The wood is hard and durable and is highly valued at least locally for making carrying poles.

It affords us unusual pleasure to associate this handsome and useful tree with the name of Professor W. C. Cheng, a dendrologist of outstanding achievements.

Quercus dispar Chun et Tsiang, sp. nov.

Arbor 8–16 m. alta partibus juvenilibus dense griseo-flavido tomentosis; ramuli tenuisculi teretes grisei serius glabrescentes lenticellis sparsis vix conspicue notati. Folia persistentia biennia tenuiter coriacea elliptico-oblonga vel obovato-lanceolata, absque petiolo 8–10 cm. longa ± 3 cm. lata, apice breviter lateque falcato-acuminata vel -acuta, basi obtusa vel cuneata, margine e tertio infero raro e medio crenato-dentata dentibus calloso-mucronatis, supra intense viridia praeter costam mediam planam sordide puberulam glabra, subtus maturitate fulvescentia ubique sparse in costa nervisque dense fasciculato-pilosula, costa tenui nervis lateralibus utrinsecus 10–13 porrecto-ascendentibus inferioribus procul a margine dissolutis ceterum ad serratulas procurrentibus omnes cum venulis subtransversis subtus tantum tenuiter prominulis conjunctis; petiolus 8–10 mm. longus sordide fusco-pilosulus; stipulae chartaceae ellipticae acutae, 5 mm. longae, 1.5 mm. latae, extus puberulae. Inflorescentiae non satis evolutae. Fructus sessiles solitarii in autumno secundo maturi. Cupula pateriformis, basi plana, tertiam partem glandis amplectens, ad 3 cm. diametro, 0.8 cm. alto, intus minute sericeo-pilosula extus flavido-griseo tomentosa, concentrice zonata annulis circiter 10 tenuibus infimis grosse erosis supremis integris. Glans depresse globosa vel disciformi-subhemisphaerica, 2.8–3 cm. lata 1.2–1.5 cm. alta, plus minusve dense puberula, apice plana umbonata, basi truncata; cicatrix plana rugulosa, 16 mm. diam.

KWANGSI: Shang-Si Hsien, Shih-Wan-Ta Shan, Feng-Hwang Hsiang, shrub 8 m. tall, in sparsely wooded ravine on wet sites beside stream, branchlets pale gray, leaves deep green above, pale green beneath, young inflorescences white, March 3, 1944, *S. H. Chun 4659.*

This species is related to *Quercus vestita* Rehder et Wilson from which it differs in indumentum, smaller differently shaped leaves with much more regular venations, and sessile deeper cup with more numerous annular rings. *Quercus Dussaudii* Hick. et A. Camus which has similar fruits, besides being glabrous, differs in having an acorn with a deeply intruded basal scar.

Quercus delicatula Chun et Tsiang, sp. nov.

Arbor 13 m. alta fructu excepto glaberrima, cortice ramulorum fere laevi pallido-brunneo (e collectore) mox purpureo- vel fusco-nigro; ramuli annotini tenerrimi obscure angulati sulcatique vetustiores teretes omnes lenticellis parvis sparsis obtecti. Gemmae ovatae obtusae brunneae, vix ultra 2 mm. longae. Folia chartacea, per duos annos persistentia petiolata elliptica vel elliptico-lanceolata, apice breviter caudato-acuminata, basi inaequaliter cuneata, toto margine integerrima exsiccando tantum leviter undulata, 4–6.5 cm. longa, 2–2.5 cm. lata, iere concoloria, supra atroviridia nitidula, subtus leviter tantum pallidiora opaca, costa nervisque tenuibus supra cum trabeculis crebre reticulatis planiusculis vix conspicuis inferne manifeste elevatis haud venulosis nervis utrinsecus 7–8 patenti-ascendentibus ad marginem arcuatis obscure confluentibus; petioli graciles superne sulcati, circiter 1 cm. longi. Flores ignoti. Fructus biennes in axillis foliorum superiorum solitarii pedicellis cum pedunculis 1–1.5 cm. longis stipitati; cupula cupuliformis, 8–11 mm. alta, 14–18 mm. diametro, tenuis sed firma, intus adpresse fulvo-sericeo-pilosa; annulis 6–7 tenuibus erosulis sursum atrobrunneis striatis glabrescentibus deorsum dense griseo-tomentosis; glans pro maxima parte exserta elliptico-oblonga apiculata, symmetrica vel saepe sursum plus minusve oblique curvata, atrocastanea lucida, 2–2.5 cm. longa et 1–1.5 cm. diametro, apice basique adpresse puberula; cicatrix plana, 5–6 mm. diam.

KWANGTUNG: Cheng Hsien, Shih-Wan-Ta Shan, tree 13 m. tall, scattered in mixed forest in dense shade, fruits light yellow, Dec. 19, 1943, *S. H. Chun 3990*.

This new species is characterized by delicate, glabrous vegetative parts, thin, relatively small, entire, caudate-acuminate subconcolorous leaves, and a small cupule with the upper half of the annular rings glabrescent and the lower half densely tomentose. It is not likely to be confused with any of the described Chinese or Indo-Chinese species.

Quercus disciformis Chun et Tsiang, sp. nov.

Arbor vulgo 10–14 m. alta (usque ad 40 m. alta et 1 m. diametro fide Wang), cortice irregulariter fisso, ramulis hornotinis sordide flavescenti-pubescentibus annotinis vetustioribusque glabrescentibus atro-corticatis minute striatis. Folia ut videtur per duos annos persistentia subcoriacea in ambitu magnitudineque satis variabilia elliptico-oblonga obovato-oblonga, vel plus minusve oblanceolata, minima 6 cm. longa et 2.5 cm. lata, maxima 13 cm. longa et 4.5 cm. lata, basi obtusa late cuneata vel subrotunda, apice in caudam angustam falcatam acutam 1–1.5 cm. longam ± subito attenuata margine supra basin vel dimidio superiore sinuato-dentata dentibus grossis incurvis calloso-apiculatis, supra olivacea subtus pallidiora in sicco utrinque brunnescentia, costa supra leviter impressa subtus elevata

nervis utrinsecus 11–13 tenuibus sensim curvatis in dentes excurrentibus venis subtransversis crebris subtus tantum prominulis, petiolis teretibus gracilibus calvis circiter 2 cm. longis. Gemmae oblongo-ovoideae acutae, 5–8 mm. longae, perulis ovatis obtusis rubro-brunneis, interioribus adpressis puberulis. Flores masculi desunt; feminei (juvenilibus ignotis) foliorum superiorum axillis 2–5 breviter spicati sessiles, pedunculo erecto tomentoso 1–2.5 cm. longo, ovario ovoideo, stigmatibus alte 3-fidis divaricatis glabris. Fructus biennes sessiles, in rhachidibus abbreviatis singuli vel raro gemini et inter se aversi cupula basi glandem tantum sustinens nullo modo amplectens plano-disciformis, 3–4 cm. diametro margine plano vel passim decurvo, intus dense molliter fulvo-sericeo-velutina, extus lamellis concentricis 8–9 tenuibus fulvo-tomentosis argute eroso-dentatis supremis integerrimis ornata; glans (e typo) 0.8 cm. alta, 3 cm. diametro, discoidea, apice impressa dense adpresse sericeo-tomentosa stylopodio valido conico truncato coronata; cicatrix concava glabra, circiter 2 cm. diametro.

KWANGTUNG: Hsin-I Hsien, Ling-Tung Pao, Chung-Tung, tree in mixed woods, leaves pale green beneath, Aug. 3, 1931, *C. Wang 31087* (TYPE); same locality, tree 10 m. tall in edge of woods, fruit immature, Aug. 3, 1931, *S. P. Ko 51729;* Yun-Fou Hsien, without precise locality, Sept. 12, 1928, *S. S. Sin No. 5160* (*Bot. Inst. Herb. No. 136531*); same district, Yun-Mu Shan, Lan-Kang, tree 40 m. tall, 1 m. diam. in community woods, cupule and acorn green, Nov. 17, 1934, *C. Wang 37392.* HAINAN: Pai-Sha Hsien, Fon-Ta Chuen, tree 9 m. tall, in dense woods, April 19, 1936, *S. K. Lau 26333.* KWANGSI: Shang-Hsi Hsien, Shi-Wan-Ta Shan, Tung-An Hsiang, tree 19 m. tall, in forested ravine side of stream, branchlets blackish brown, fruits pale brown, Feb. 3, 1944, *S. H. Chun 4492.*

This new species is distinguished from all other species known to us by the thin flat broad involucre, velvety tomentose inside (excepting the basal scar) supporting, but not at all embracing, a slightly narrower more or less depressed acorn. The acorns as described are evidently immature, those collected later in the season are fully 1.5 cm. long and uniformly hemispheric. In most specimens the fruits are solitary but in others they are borne, back to back, in pairs from the same level on opposite sides of a short spike.

Quercus Paohanii Chun et Tsiang, sp. nov.

Arbor ramosissima usque ad 15 m. alta fructu et partibus junioribus floribusque exceptis glaberrima, coma umbraculiformi, ramis ramulisque gracilibus; cortex griseus profunde et irregulariter fissus; ramuli hornotini angulati atrobrunnei sparse pilosi annotini vetustioresque teretes pallidiores glabrescentes conspicue lenticellati. Gemmae oblongo-ovoideae compressae acuminatisissimae perulis ovatis obtusis biserialibus ciliatis. Folia tenuiter coriacea per duos annos persistentia elliptico- vel lanceolato-ovata raro lanceolata in caudam angustam acuminatisissimam 1.5–2 cm. longam sensim attenuata, basi late inaequaliter cuneata vel in maxima fere rotundata, margine subtiliter revoluta integerrima vel saepe in adulta remote serrulata dentibus obtusis recurvis, supra nitidula subtus pallidiora, 5–8 cm. longa et 1.5–2 cm. lata (maxima 10 × 3 cm.), costa nervisque supra applanatis vel paulo impressis subtus costa prominenti et lateralibus utrinsecus 10–12 ante marginem furcatis petioli 4–6 mm. raro usque 10 mm. longi. Stipulae caducissimae subulatae longe pilosae circiter 1 cm.

longae. Amenta mascula subpendula in axillis foliorum vel bractearum solitaria 5–6 raro-7 cm. longa rhachis parce pilosa angulata; flores singuli sessiles, perianthii lobis 5 membranaceis brunneis ovatis albo-pilosis ciliatis 1 mm. longis; stamina exserta antheris ovoideis filamenta subaequilongis circiter 0.5 mm. longis. Flores feminei spicati in axillis foliorum solitarii, pedunculo 3–7 mm. longo, stigmata ad 1 mm. longa crassiuscula divaricata. Fructus biennes sessiles subglobosi vel oblongo-ovoidei; cupula semiglobosa 1 cm. diametro intus dense cinereo-tomentosa, squamis permultis imbricatis ovatis cinereo-tomentosis apicibus glandulosis; glans subglobosa 1 cm. longa et 6 mm. diametro apice puberula, stigmatibus subcapitatis deciduis.

KWANTUNG: Yu-Yuen, Hsien, Wu-Yang Shih, tree in woods, Nov. 19, 1940, *P. H. Liang 532* (TYPE); Tung-Shui Ts'ung, tree 5 m. tall, Jan. 8, 1941, *P. H. Liang 83015*. HUNAN: I-chang Hsien, Li-Yuan-Pao, in light woods, April 8, 1942, *S. H. Chun 2099;* same locality, Nov. 10, 1943, *S. H. Chun 2946;* tree 12 m. tall, flowers greenish, March 25, 1943, *S. H. Chun 2977*. KIANGSI: Without precise locality, April-May 1942, *S. M. Mu 21138*.

This evergreen oak with unusually small acorns is very common in the vicinity of Li-Yuan Pao, I-chang Hsien, S. Hunan where a branch of the Botanical Institute was established throughout the war. It thrives from level-land up to an altitude of 1000 m., intermixed with deciduous species and conifers. Its range extends from the northern part of Yu-Yuan District in Kwangtung province to the foot of Mang Shan, the famous region in southern Hunan where virgin forests still exist. The edible acorns of this tree, colloquially called Chui-li, are sold in local markets. The wood is fine and durable, much used by the natives for making furniture and handles of various kinds of tools. It is especially good for preparing charcoal.

This graceful oak which no doubt will become a common ornament in local and foreign gardens is named after the collector, Mr. Pao-Han Liang, Lecturer in Botany of this Institute.

Quercus bella Chun et Tsiang, sp. nov.

Arbor 9 m. alta dense ramosa confertifolia (e collectore) fere omnino glabra ramis ramulisque gracillimis minute lenticellatis ultimis angulatis fuscis vetustioribus subteretibus nigro-corticatis. Folia per duos annos persistentia crasse membranacea lanceolata absque petiolo 7–13 cm. longa 2.5–3.5 cm. lata, apice sensim acuteque acuminata, basi attenuata e medio sursum crenato-dentata dentibus utroque latere plerumque 9 calloso-apiculatis, supra atroviridia nitidissima costa nervis venulisque planis leviter tantum prominulis subtus laete viridia opaca nervis lateralibus primariis 14–16 ascendentibus fere rectis inferioribus versus marginem curvatis superioribus in dentibus exeuntibus atque costa elevata prominentibus venulis transversis tenuissimis crebre connexis, petiolis tenuibus 5–10 mm. longis. Flos masculinus ignotus. Flores feminei ad apicem pedunculi gemini sessiles pedunculo in axillas foliorum superiorum solitario erecto quam petiolo breviore circ. 12 mm. longo; bracteae sub flore 3 valde inaequales, majora semi-circularis, omnes dorso pilosulae; perianthium urceolatum extus deorsum glabrum vertice annulatim adpresse denseque sericeo-pilosum; styli 4 robusti apice in stigmatem crassum capitatum

lobulatum abrupte dilatati. Fructus ut videtur triennis solitarius sessilis; cupula pateriformis fere plana tantum tenuiter marginata 5 mm. alta 3 cm. lata glande paulo latior, intus adpresse fulvo-pilosa centro umbilico convexo circ. 16 mm. lato conspicue notata, extus atrata glabrescens concentrice annulata annulis 7 laxis levibus planis inferioribus latis grosse irregulariter erosis marginalibus 2 vel 3 angustissimis multo proprioribus integris; glans depresse hemisphaerica basi cupulae solum adnata, 1.6–1.8 cm. alta 2.5–2.8 cm. lata, atrocastanea adulta glabrata apice umbone conico circumcirca annulato obscure puberulo coronata; cicatrix margine gradatim curvata concava usque ad 16 mm. lata.

KWANGTUNG: Fang-Cheng Hsien, Shi-Wan-Ta Shan, alt. 200–250 m., shrubby tree in sparsely wooded ravine along stream on moist sites, branchlets blackish, leaves deep green above, light green beneath, dry fruits brown, Mar. 24, 1944, *S. H. Chun 4772*.

Differs from *Q. Dussaudii* Hick. et A. Camus in the dentate leaves with more numerous lateral veins and the shallow cup only supporting, not at all enclosing the acorn. According to the collector, this oak is suitable for carpentry. The felled logs left *in situ* are used for the culture of edible mushrooms. This tree has ornamental qualities which recommend it for landscape planting.

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NOTES ON CHINESE STERCULIACEAE

WOON-YOUNG CHUN AND HSIANG-HAO HSUE

Sterculia subracemosa Chun et Hsue, sp. nov.

Frutex parvus ramulis juvenilibus gracilibus sparse stellato-tomentosis, sicco striatis rubro-brunneis. Folia subcoriacea obovato-oblonga, 11–18 cm. longa, 4–6.5 cm. lata, apice obtusa vel acutiuscula, basi acuta vel cuneata, utraque pagina glabra, nervis primariis lateralibus utrinsecus 8–10 ascendentibus inter se anastomosantibus cum venulis utrinque valde prominentibus; petiolus 1.5–2.5 cm. longus, apice basique incrassatus, initio dense stellato-tomentosus deinde glabrescens. Inflorescentia subracemosa, plus minusve pendula, gracillima, usque ad 10 cm. longa, dense rufo-stellato-tomentosa, pedicellis ultimis 8–10 mm. longis, articulatis, bracteolis lineari-lanceolatis, acutis, 2 mm. longis, tomentosis. Flores ♂ ignoti; perfecti albi, roseo-tincti; calyx 13 mm. longus 5-lobatus extus pubescens intus praeter partem superiorem loborum glaber, lobis ovato-lanceolatis tubo campanulato subaequantibus vel leviter longioribus, margine ciliolatis; antherae 17 (an semper?) prope basin ovarii aggregatae, biloculares, connectivo incrassato; ovarium globosum circiter 1.5 mm. diam. dense pubescens gynophoro 2.5 mm. longo puberulo; stylus 1 mm. longus pubescens, stigma 5-lobata. Fructus ignotus.

KWANGTUNG: Hsin-I District, Tung-Kang, small shrub along stream, flowers white, tinged pink, March 21, 1932, *C. Wang 31738**.

This species is allied to *Sterculia lanceaefolia* Roxb., differing in the obovate leaves and pale flowers. In certain characters it approaches *S. hainanensis* Merr. et Chun, but the obovate-oblong leaves and larger flowers are obviously different from those of the latter species.

Sterculia micrantha Chun et Hsue, sp. nov.

Arbor 7 metralis, ramis ramulisque medulla ampla alba spongiosa repletis; ramuli validi teretes foliorum delapsorum cicatricibus magnis lenticellisque sparsis brunneis notati, siccitate rubro-brunnei valde striati. Folia non satis matura elliptico-oblonga, tenuiter chartacea, 7–14 cm. longa, 3.5–6.5 cm. lata, apice obtusa vel abrupte acuta, basi late cuneata, supra glabrescentia, subtus ad costam venasque sparse stellato-tomentosa, costa valida nervis primariis lateralibus utrinque 12, patenti-ascendentibus subtus prominentibus; petiolus 3–8 cm. longus, sparsissime stellato-tomentosus; stipulae lineari-lanceolatae, 10–12 mm. longae, tomentosae. Inflorescentia paniculata, gracilis, usque ad 26 cm. longa, multiflora; pedicelli ultimi filiformes 3–4 mm. longi, articulati, leviter tomentosi; calyx albus, tenuis, campanulatus, 5–6 mm. longus, 5-lobatus, extus parce puberulus intus praeter lobos glaber sed manifeste papillosus lobis tri-

* Type specimens listed in this paper are deposited in the Herbarium of the Botanical Institute, Sun Yatsen University, Canton, China; duplicate types will be sent abroad as soon as conditions permit.

angulari-lanceolatis tubo aequantibus, margine dense ciliolatis. Flores ♂ : androphorum 3 mm. longum gracile, glabrum; antherae 10, ad apicem androphori sessiles, biloculares, connectivo crasso. Flores ♀ : antherae circiter 15, circa basin ovarii aggregatae; ovarium cum gynophoro 1.2 mm. longo dense tomentosum, globosum, 5-loculare; stylus gynophoro aequilongus pubescens; stigma 5, globosa. Fructus ignoti.

YUNNAN: King-Tung District, Tsu-Kai, alt. 1400 m., tree 7 m. tall, in light woods, leaves lustrous green above, pale green beneath, flowers white, Oct. 5, 1933, *Y. Tsiang 12308*.

This very distinct species is not closely allied to any of the known Chinese species. It is characterized by stout branchlets with broad spongy pith and relatively small white flowers in slender panicles.

Sterculia Henryi Hemsley var. **cuneata** Chun et Hsue, var. nov.

Planta habitu omnino typi et fortasse cum eo congruens sed foliis deorsum manifeste attenuatis basi cuneatis acutisve haud rotundatis, floribus minoribus.

Arbor vel arbuscula 3–5 m. alta. Folia obovato-oblonga 15–21 cm. longa, 4.5–6.5 cm. lata, apice plus minusve longe subitoque acuminata, infra medium versus basin distincte attenuata, basi cuneata vel acuta; petiolus 4–8 cm. longus. Racemi usque ad 7 cm. longi. Flores (e nota ad vivum) pallide rosei; calycis segmenta vix ultra 10 mm. longa.

YUNNAN: Ma-Kuan Hsien, N. W. of Ta-Wei Shan, alt. about 1000 m., in dense wooded ravine along stream, shrub 3–5 m. tall, flowers pale red, March 15, 1940, *Wang, Ko and Lau 10032*; same locality, Ching-ya, alt. 800 m., tree on sparsely wooded slope, flowers pink, April 4, 1940, *Wang, Ko and Lau 10496* (TYPE).

Reevesia lofouensis Chun et Hsue, sp. nov.

Arbor vel frutex, 4–13 m. alta, ramulis novellis dense stellato-tomentosis, fere levibus, siccitate albo-flavidis. Folia coriacea elliptico-oblonga 10–15 cm. longa, 3.5–6 cm. lata, apice in acumen latum obtusum vel acutiusculum contracta, basi inaequilateraliter cuneata, utrinque glabra, margine undulata, in sicco utrinque brunnescentia, costa subtus elevata, nervis primariis lateralibus utrinsecus 6–8, sursum furcatis, subtus tantum elevatis, venulis supra fere obsoletis; petiolus 1–3.5 cm. longus teres utrinque vix dilatatus, novellus stellato-tomentosus, mox glabrescens. Inflorescentia non satis evoluta paniculata, terminalia, circiter 4 cm. longa lataque, multiflora, dense fulvido-stellato-tomentosa. Gemmae florales obovoideo-globosae, circ. 2 mm. diam. Capsula oblongo-pyriformis, 5-angulata, rugosa, dense stellato-puberula; pedicellus circ. 2 cm. longus; semina 12 mm. longa 6 mm. lata, elongato-thyrsoidea, glabra, alis oblongis obtusis hyalinis nitidis brunneis, 2 cm longis, 1 cm. latis.

KWANGTUNG: Lo-Fou Shan, Hua-Hsou Tai, tree 13 m. tall in woods, branchlets green, leaves deep green above, pale green beneath, May 3, 1930, flowers in bud, *N. K. Chun 40822*, same locality, shrub 4 m. tall, fruit green, brownish tinged, July 24, 1930, *N. K. Chun 41342* (TYPE).

This species is related to *Reevesia thyrsoidea* Lindley and *Reevesia longipetiolata* Merr. et Chun, but differing from both in its densely stellate-tomentose branchlets and peduncles, thicker, fewer veined, cuneate leaves, and tomentose petiole not dilated at both ends.

Reevesia taiwanensis Chun et Hsue, nom. nov.

Reevesia formosana Hayata Ic. Pl. Formos. 9: 8. 1919, non Sprague in Kew Bull. 1914: 325. 1914.

FORMOSA: Hiiranzan, leg. *Hayata et Sasaki s. n.*, July 1912.

Although the two specimens are not exactly comparable, the one collected by A. Henry on which Sprague's species is based is in flower, and the other, described by Hayata, is in fruit, we are confident that two distinct species are involved judging by vegetative characters alone. *Reevesia formosana* Sprague is easily distinguished by the rounded to cordatulate leaf-bases.

Helicteres viscida Blume Bijdr. 1: 79. 1825, Kurz Fl. Brit. Burma 1: 143. 1877; Pierre Fl. Cochinch. pl. 209A. 1888–91, Gagnep. in Lecomte Fl. Gén. Indo Chine 1: 489. 1911; Ridley Fl. Malay Peninsula 1: 281. 1922; Chung in Mem. Sci. Soc. China 1: 168. 1924; Craib Fl. Siam. Enum. 1: 175. 1925.

HAINAN: Po Ting District, vicinity of Tung Chiah, in ravine, subshrub, flowers white, Dec. 4, 1936, *L. Tang 430*; same locality, Oct. 10, 1936, *S. K. Lau 28343*; Ting An District, Dec. 4, 1933, *C. Wang 35181*; Ling Shui District, Seven-Finger Mountain, Jan. 11, 1934, *C. Wang 36352*; Ling-Shui District, Tung-Chiah, Nov. 18, 1932, *Tso & Chun 44283*.

DISTRIBUTION: Java, Malay Peninsula, Burma, Indo-China, Siam, China: Yunnan (fide Gagnepain, l.c.). New to Hainan.

Eriolaena spectabilis (DC.) Planchon ex Mast. in Hook.f. Fl. Brit. Ind. 1: 371. 1874.

Wallichia spectabilis DC. Mem. Mus. 10: 104. *t.6*. 1823.
Microlaena spectabilis Wall. List No. 1173, 1828.
Gumsia tiliacea Wall. List No. 1173D, 1828.
G. chloroxylon Ham. in Wall. List p.157. 1173E. 1828.
Eriolaena sp. Chung in Mem. Sci. Soc. China 1: 167. 1924.

YUNNAN: Szemao, *A. Henry 12506*, ex Herb. Kew; Mi-Le Hsien, Dec. 2, 1932, *H. T. Tsai 51393*. KWANGSI: Hsi Lin District, alt. about 800 m., tree 7 m. high, bark gray, fruits silvery, dehiscent, July 2, 1936, *W. H. Soo 67905*.

DISTRIBUTION: India, Central Himalaya; China: Yunnan, Kwangsi.

Henry's 12506 which the senior author examined at Kew undoubtedly belongs to this species. Presumably this is the first authentic record of the species for China.

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KAJEWSKIELLA, A NEW RUBIACEOUS GENUS FROM THE SOLOMON ISLANDS

E. D. Merrill and L. M. Perry

With one plate

KAJEWSKIELLA GEN. NOV.

Calycis tubus cylindricus, gracilis; limbi cupularis lobi 5, lineares, elongati, persistentes. Corolla tubularis, in alabastro oblongo-clavata, extus dense villosa, tubo intus glabro; limbi lobi 5, erecti, valvati. Stamina 5, basin paullo supra tubi corollae inserta, filamentis compressis, glabris; antherae dorso affixae, non versatiles, paullo exsertae, lineares, obtusae. Discus annularis. Ovarium 2-loculare; stylus teres, exsertus, stigmate punctiformi; ovula numerosa, placentis septo adnatis inserta. Capsula erecta, teres, siliquaeformis, septicide 2-valvis, vetusta epicarpio (demum saepe fibroso) ab endocarpio cartilagineo margine placentifero vel nudo secedente, polysperma. Semina numerosa, adscendentia, minuta, in sicco angulata, testa reticulato-punctata, albumine carnoso; embryo clavato-oblongus. Frutices ramosi, pubescentes. Folia opposita, petiolata, membranacea, lanceolata vel elliptico-lanceolata. Stipulae interpetiolares, triangulari-ovatae, subpersistentes. Racemi simplices, axillares, pauciflori, sub anthesin abbreviati, in fructu longissime pedunculati. Flores majusculi, pubescentes.

Kajewskiella trichantha sp. nov.

Frutex usque ad 5 m. altus; ramulis teretibus vel internodiis superioribus compressis, villosulis; foliis membranaceis, lanceolatis vel elliptico-lanceolatis, 12–25 cm. longis, 3.5–8 cm. latis, utrinque sensim angustatis, basi attenuatis in petiolum decurrentibus, apice acute acuminatis, acumine 1–1.5 cm. longo, margine integris, supra costa villosula lamina consperse et sparsim pilosa, subtus novellis dense adpresse ferrugineo-villosis vetustioribus costa venisque dense et lamina sparsim adpresse villosis, nervis lateralibus utrinsecus 15–20 oblique arcuatis prope marginem adscendentibus, utrinque perspicuis, venulis manifestis vel inconspicuis; petiolo 1.5–5.5 cm. longo, gracili, villoso; stipulis triangulari-ovatis, 1–1.5 cm. longis, 5–7 mm. latis, longiuscule acuminatis, costa et basin versus ± adpresse villosulis, marginem versus glabratis, subpersistentibus; racemis axillaribus, ad anthesin 5–7 cm. longis (floribus inclusis), in fructu 6–17 cm. longis, omnino villosulis; floribus 3–7, pedicellatis, pedicellis brevibus basi bracteatis; calycis limbo cupulari, 2.5 mm. longo, lobis linearibus, acutiusculis, 5–7 mm. longis, 1 mm. latis; corolla tubulari vel in alabastro oblongo-clavata, tubo 2.5–3 cm. longo, 6–7 mm. diametro, intus glabro, lobis circiter 7 mm. longis, acutis, erectis vel adscendentibus, intus glabris; staminibus ± 5–7 mm. supra basin corollae tubi insertis, paullo exsertis,

filamentis compressis, glabris, antheris linearibus, 4 mm. longis, dorso affixis, non versatilibus, rimis introrsum dehiscentibus; disco annulari; stylo tereti, 3.9 cm. longo, stigmate punctiformi, non papilloso; ovario tubulari, 6–7 mm. longo, vix 1.5 mm. diametro, biloculare; capsula vix 3 cm. longa, 2 mm. diametro, calyce persistente coronata; seminibus numerosis, minutis, reticulato-punctatis.

SOLOMON ISLANDS: Bougainville: Kupei Gold Field, *Kajewski 1659, 1667*, April 1930, alt. 950 and 900 m., rain forest (plant up to 5 m. high, but often found much smaller; buds 4.5 cm. long, 1.3 cm. diameter, beautiful pink, semi-transparent); same locality, *Kajewski 1734* (TYPE), April 1930, alt. 1000 m., rain forest (flowers pink, covered with white hairs).

While working over the Rubiaceae of Papuasia as represented in the Richard Archbold Expeditions collections from New Guinea, and the Brass and Kajewski collections from the Solomon Islands, we found the above cited specimens which we were unable to name to genus, although they clearly belong in the family. For this material we here propose the new genus *Kajewskiella*. At present we are unable to suggest an affinity for it. According to the classification of the family in Engler and Prantl, Pflanzenfam. IV. 4: 16. 1891, it seems to belong to the Oldenlandieae. In its ferrugineous-villous indumentum, in its stipules, in the form and texture of the leaves as well as in the venation, and in the minute reticulate-punctate seeds, *Kajewskiella* strongly suggests *Xanthophytum* Reinw., but in its technical characters it is not allied to that genus. The very slender terete capsule is somewhat like an abbreviated fruit of *Dolicholobium* A. Gray; both have septicidal dehiscence, and the exocarp becomes more or less shredded in age as in that genus, and in *Bikkia* Reinw.; the valves of the fruit persist as in the latter genus, and the placentae are either broken free or attached along the margins of the valves. The similarity of these characters, however, is probably only superficial. The fairly large tubular or very narrowly elongate obconical corolla entirely glabrous within, the glabrous stamens attached a little above the base of the corolla (about where it emerges from the calyx), the non-papillate stigma, and the short slender terete capsule seem to offer a combination of characters which we believe worthy of generic recognition.

EXPLANATION OF PLATE

PLATE I

FIG. *a*. Flowering branchlet, × ½; *b*. Flower, × 1; *c*. Flower laid open, × 1; *d*. Fruit, × 1; *e*. Old fruit after dehiscence, × 1; *f*. Portion of placenta to show attachment of ovules, × 10; *g*. Seed, × 10.

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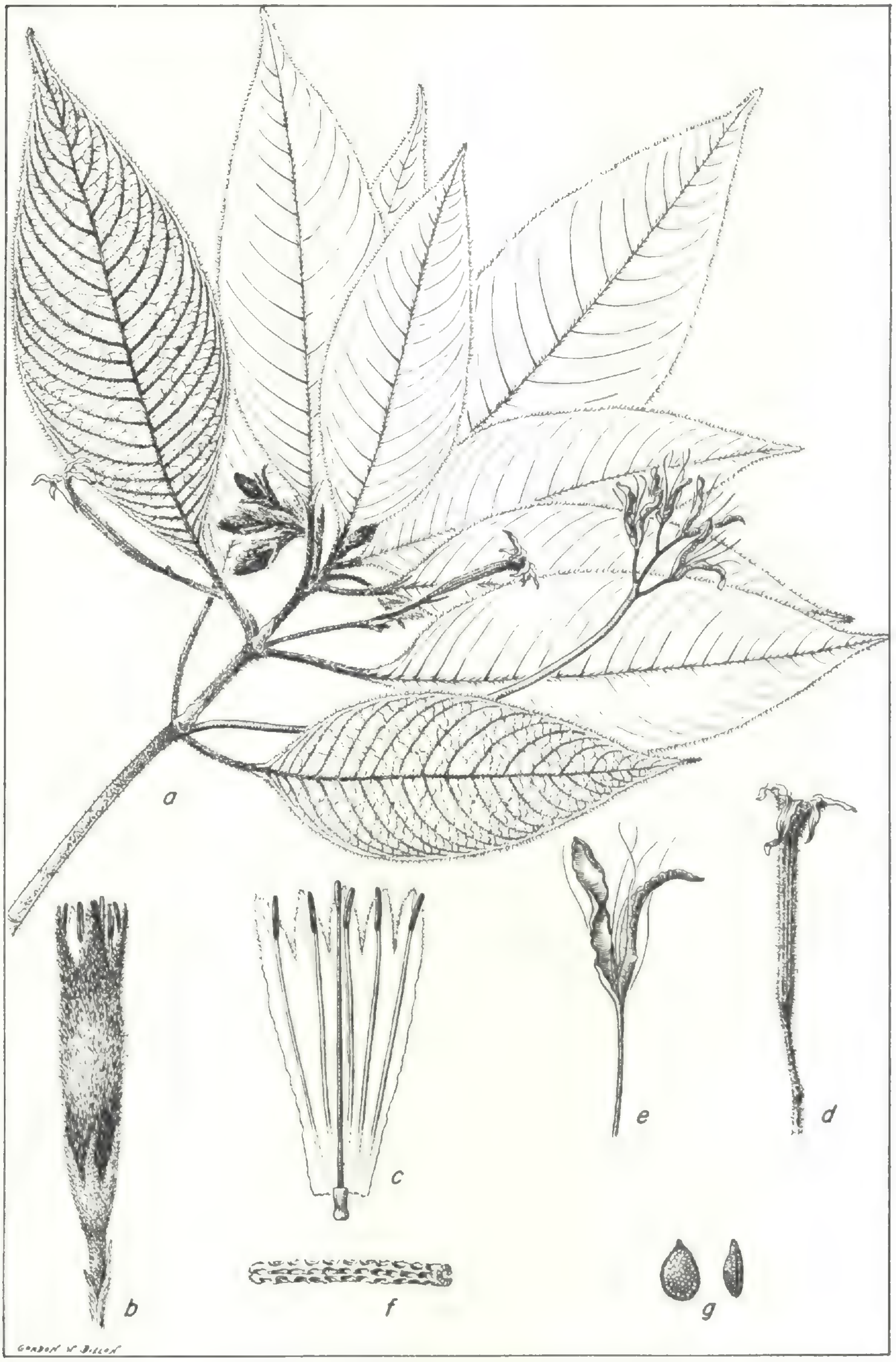

KAJEWSKIELLA TRICHANTHA MERRILL & PERRY

TWO NEW FLOWERING PLANTS FROM ST. LUCIA

A. C. Smith and H. A. Gleason

Among the West Indian specimens which Dr. John S. Beard, formerly of the Forest Department, Trinidad, has sent to the Arnold Arboretum in recent years, the two species from St. Lucia discussed below appear to be hitherto undescribed.

ROSACEAE

Licania oligantha A. C. Smith, sp. nov.

Arbor 5–15 m. alta, ramulis gracilibus, hornotinis complanatis sericeo-puberulis, annotinis teretibus glabrescentibus lenticellatis; stipulis lineari-lanceolatis 4–8 mm: longis sericeis mox caducis; petiolis subteretibus rugulosis 2–5 mm. longis primo pallide sericeis mox glabris; laminis chartaceis utrinque in sicco olivaceis oblongo-ellipticis, (3.5–) 5–10.5 cm. longis, (1.8–) 2.5–4.5 cm. latis, basi obtusis vel acutis et in petiolum breviter decurrentibus, in apicem calloso-apiculatum cuspidatis, margine integris et leviter recurvatis, juventute subtus et costa supra sparse strigillosis mox glabrescentibus, costa supra leviter elevata subtus prominente, nervis secundariis utrinsecus 6–10 erecto-patentibus leviter curvatis anastomosantibus et rete venularum copioso utrinque prominulis; inflorescentiis plerumque axillaribus interdum terminalibus compacte cymoso-paniculatis sub anthesi 1–2.5 cm. longis et plerumque 1–5-floris, pedunculo leviter complanato brevissimo et ramulis sericeo-puberulis, bracteis oblongis puberulis 3–3.5 mm. longis, ramulis lateralibus paucis 2–5 mm. longis plerumque unifloris raro 2- vel 3-floris, bracteolis 2 oppositis membranaceis ovatis 2–2.5 mm. longis minute sericeis; floribus subsessilibus, pedicellis ad 1.5 mm. longis; calyce cupuliformi sub anthesi 5–6 mm. longo et apice diametro, extus arcte sericeo, tubo 2–2.5 mm. longo basi subacuto intus copiose et breviter sericeo, limbo erecto-patente profunde 5-lobato, lobis papyraceis deltoideis 3–3.5 × 2–3 mm. apice acutis intus puberulis basi anguste imbricatis; petalis 5 membranaceis obovato- vel ovato-ellipticis, 2–3 mm. longis, 1.3–1.5 mm. latis, basi rotundatis, apice obtusis, intus hispidulis extus puberulis mox glabrescentibus et caducis; staminibus 15–20 sub anthesi leviter exsertis, filamentis ligulatis 2.5–3.5 mm. longis utrinque copiose pallido-hispidulis superne angustatis glabrisque, antheris ellipsoideis 0.5–0.6 mm. longis; ovario ellipsoideo copiose hispidulo, stylo tereti circiter 5 mm. longo praeter apicem glabrum copiose hispidulo, stigmate minute peltato.

St. Lucia: Quilesse, alt. 300 m., *J. S. Beard 492* (type, Arnold Arb.), June 5, 1945 (tree 15 m. high, rare in understorey of rain-forest; trunk 50 cm. diam., fluted; flowers creamy white; fruit blue, attractive to birds); La Sorcière, alt. 700 m., *J. S. Beard 488*, June 1, 1945 (tree 5 m. high, in elfin woodland; trunk 30 cm. diam.; flowers creamy white).

Licania oligantha is characterized by its very compact few-flowered inflorescences and its concolorous essentially glabrous leaf-blades. From *L. leucosepala* Griseb., originally described from Guadeloupe but also recorded from Dominica, St. Vincent, and St. Lucia (by R. O. Williams, Fl. Trinidad & Tobago 1: 315. 1932, as *Moquilea leucosepala*), the new species differs not only in its inflorescence, but also in its slightly smaller leaf-blades with fewer secondaries and its obscurely sericeous rather than cano-tomentose calyx. In referring plants of this alliance to *Licania* rather than *Moquilea*, I follow the generally accepted reduction of the latter genus.

Concerning this species Dr. Beard writes: "It is a small tree with a trunk up to 30 cm. in diameter; the wood is hard and of no economic value. It is almost confined to the exposure sub-type of the rain-forest in the interior of St. Lucia, occurring on the crests of all but the highest ridges and Pitons. I have noted it on La Sorcière, Piton Flore, Piton St. Esprit, Grand Magazin, Morne Tabac, and the slopes of Morne Gimie, at elevations of 1600 to 2200 ft. [Note: The type-collection was found at a lower elevation]. The species is not found in the elfin woodland at the top of Morne Gimie (3000 ft.), and it is very rare in the normal rain-forest of lower elevations. In its particular association it is one of the principal dominants, forming approximately 30% of the stand. The associate dominants are *Micropholis chrysophylloides*, *Myrcia* sp. (*Beard* no. *478*), and *Tovomita Plumieri*. Together with a number of species of lesser abundance, these plants form a low forest of small trees some 30 ft. high, a reduced type due to exposure to wind. In the other islands the principal dominants of the equivalent forest type are *Richeria grandis*, *Micropholis chrysophylloides*, and *Podocarpus coriaceus*. The first of these has not been found by me on St. Lucia, and the last is very rare, found only on Morne Tabac. The *Licania oligantha–Micropholis chrysophylloides* association of St. Lucia is, therefore, an interesting special type."

MELASTOMATACEAE

Miconia luciana Gleason, sp. nov. Sect. *Octomeris*.

Arbor 8 m. alta, ramis juvenilibus sparsissime furfuraceis mox glabris. Petioli usque 7.5 cm. longi, sparse furfuracei praesertim supra atque sparse glanduloso-hirtelli. Laminae tenues virides, ovato-lanceolatae vel fere ellipticae, maxima qua suppetit 20 cm. longa 10 cm. lata, acuminatae, crenato-serratae, subcordatae, 5-nerviae, utrinque glabrae. Inflorescentia pedunculata, late pyramidalis, ca. 1 dm. longa, trichotoma. Flores 5-meri, omnes sessiles, saepe solitarii ad apices ramulorum. Hypanthium obconicum, 2.7 mm. longum ad torum, minutissime furfuraceum. Calycis tubus 0.8–0.9 mm. longus, truncatus, ad marginem fere scariosus; sepala obsoleta; dentes exteriores conici, ad tubum adnati, ultra tubum 0.3 mm. projecti. Petala rosea, obovato-oblonga, 5.5–6 mm. longa, 3–3.5 mm. lata, fere equilatera, vix retusa. Stamina isomorpha; filamenta glabra, 3.3 mm. longa; antherae lineares, 3.2 mm. longae, 2-loculares, poro

terminali dehiscentes; connectivum infra thecas 0.2 mm. productum, simplex, leviter dilatatum. Ovarium fere inferum, 4-loculare; stylus rectus, glaber, 6.7 mm. longus, inferne dilatatus; stigma truncatum.

ST. LUCIA: Quilesse, alt. 300 m., *J. S. Beard 477* (TYPE in herb. N. Y. Bot. Gard.; dupl. Arnold Arb.), May 23, 1945 (tree 8 m. high, in understorey of rain-forest; trunk 10 cm. diam.; flowers pink; local name: *bois cendre*).

From its general aspect and from the nature of the inflorescence and the structure of the flowers, *M. luciana* appears related to the Puerto Rican *M. Thomasiana* DC. It differs from that species in its thinner leaves and various other structural characters.

Of *Miconia luciana* Dr. Beard writes: "It is a small tree, frequently only 3 m. high, with rather conspicuous pinkish flowers. I have found it occasionally in the understorey of the *Dacryodes–Sloanea* rain-forest throughout St. Lucia."

ARNOLD ARBORETUM,
HARVARD UNIVERSITY,
and
NEW YORK BOTANICAL GARDEN.

ASTRAGALUS IN ARGENTINA, BOLIVIA AND CHILE

IVAN M. JOHNSTON

ONLY IN SOUTH AMERICA does the great genus *Astragalus* have an extensive development in the southern hemisphere. There are ten species reported from the mountains and plateaus of tropical Africa. In the temperate southern parts of that continent the genus is represented only by one species in Natal. In South America, however, there are nearly ninety species. The genus is represented along the cordilleras from Ecuador to the Straits of Magellan, and has two important centers of speciation, one in the high country of northwestern Argentina and adjacent Bolivia and another in adjoining Chile and Argentina along the cordilleras south of the peak of Aconcagua.

Though the present paper treats the species known from south of Peru, all the South American species of *Astragalus* were studied during its preparation. Accounts of the two Ecuadorean species, and of seven of the Peruvian species have already been published, Jour. Arnold Arb. 19: 88–96 (1938). The present paper treats the remaining seventy-seven species of the genus known to me from South America.

In general structure and appearance the South American *Astragali* are rather similar to those found in North America. Their relations are with the North American and not with the Old World members of the genus. They are probably the products of an ancient southern migration and subsequent differentiation of various types originating in North America where the genus has one of its major evolutionary centers. In North America, *Astragalus* is represented from Alaska and Baffinland south to northern Guatemala, with most of its more than three hundred species concentrated in western United States. The areas occupied by North and South American species are, accordingly, separated by Colombia and nearly all of Central America, and their major areas of speciation by the great distance between Argentina and the United States.

The close relationship between North American species and others in Argentina and Chile is frequently very clear. Indeed, some of the southern plants seem to be more closely related to the northern ones than they are to any found on their own continent. None, however, seems to be specifically identical with North American plants. Though there are many close similarities between northern and southern species, evolution in South America has not closely paralleled that in North America. This becomes very clear if an attempt is made to apply to the South American species the system of segregate genera set up for the North American species by Rydberg, No. Am. Fl. 24: 251–462 (1929), and Am. Jour. Bot. 15: 584–595 (1928), 16: 197–206 (1929), and 17: 231–238 (1930). Some of the South American species fall readily into the Rydbergian

segregates, but many straddle the arbitrary lines between these so-called genera, and others simply do not fit into any of them.

No satisfactory subgeneric classification of the South American species has been worked out. Rydberg's classification seems artificial at many places and furthermore is to be condemned as provincial, since it is based almost exclusively on species of one region and without full consideration of those in other parts of the world. It would have to be modified considerably, as well as amplified by the addition of comparable new groups, before it could accommodate the South American species satisfactorily. That, however, is a task that should be left to a monographer with a wide acquaintance of the genus as developed in all parts of the world. *Astragalus* has only one clean line of cleavage in South America. This breaks the genus into two natural groups probably worthy of generic recognition. One, the section Phaca, with fifteen species, is readily distinguished by its well separated, distinct, herbaceous stipules. The other, the section Euastragalus, has more or less united, membranous, ochraceous stipules and includes over seventy species.

In the present paper the synonymy given for the species is complete except for certain names published by Otto Kuntze, Rev. Gen. 2: 940–949 (1891), and 3^2: 73 (1898). Substituting the name *Tragacantha* for *Astragalus*, Kuntze published hundreds of new combinations under the former invalid name. It has seemed a waste of space to reprint the scores and scores of useless binomials he applied to South American species. Only when he coined new specific epithets for South American species, are Kuntze's names of any taxonomic significance and only the latter are listed in the synonymy given in this paper.

Among the large number of specimens studied, only about half are cited. Under well understood species, of which I have seen numerous specimens, I have cited only selected collections to show geographic range. Only under new, rare, or poorly understood species has all the examined material been cited. The particular herbaria in which the examined specimens are located are indicated by abbreviations, in parentheses, following the collector's name.

During the preparation of this paper the specimens in many herbaria have been examined. The basic herbarium and library work was carried on at the Gray Herbarium. During a visit to Europe the genus was studied at Kew, London, Hamburg, Berlin, Munich, Geneva, and Paris, and loans of selected material from these botanical centers were later studied at the Gray Herbarium in conjunction with loans of South American *Astragali* from Stockholm, Upsala, New York, Washington, and Chicago. From South America much interesting material has been received on loan and for identification. Dr. Angel Cabrera of La Plata, sent specimens and arranged the loan of Spegazzini's *Astragalus*. To Prof. L. R. Parodi, Dr. Arturo Burkart, Prof. Alberto Castellanos, Sr. A. Ruiz Leal, and Sr. Juan V. Monticelli I am indebted for many interesting specimens. Prof. Marcial R. Espinosa sent me some of the collections

and very obligingly loaned me fragments of certain critical specimens in the Philippi Herbarium. Other very interesting and useful Chilean collections have been received from Sr. Gualterio Looser, Sr. Gilberto Montero, and Dr. C. Grandjot. I have had help from many sources and I am grateful to the many botanical friends in Europe and America who have aided in this work on the genus *Astragalus*.

The abbreviations for the herbaria cited in this paper are as follows: BD=Herb. Bot. Mus., Berlin-Dahlem, Germany; Behn=Herb. Dr. K. Behn, Valparaiso, Chile; BM=Herb. British Mus. Nat. Hist., London, England; Boiss=Boissier Herb., Geneva, Switzerland; Burkart=Herb. Inst. Bot. Darwinion. Buenos Aires, Argentina; Calif=Herb. Univ. California, Berkeley, California; Del=Delessert Herb., Geneva, Switzerland; FM=Herb. Chicago Nat. Hist. Mus. [Field Mus.], Chicago, Illinois; G=Gray Herb., Harvard Univ., Cambridge, Massachusetts; Gottenburg=Herb. Hort. Bot. Gottenburg, Gottenburg, Sweden; Grandjot=Herb. Dr. C. Grandjot, Santiago, Chile; Hamb=Herb. Inst. Allg. Bot., Hamburg, Germany; K=Herb. Roy. Bot. Gard., Kew-Surrey, England; LP=Herb. Mus. La Plata, La Plata, Argentina; Munich=Herb. Bot. Mus., Munich, Germany; NY=Herb. New York Bot. Gard., New York, New York; Paris=Herb. Mus. Hist. Nat., Paris, France; Parodi=Herb. Dr. L. R. Parodi, Buenos Aires, Argentina; Santiago=Herb. Mus. Nac., Santiago, Chile; Speg=Herb. Mus. La Plata, La Plata, Argentina; Stock=Herb. Riksmus., Stockholm, Sweden; US=United States Nat. Herb., Washington, D. C.; Upsala=Herb. Upsala Univ., Upsala, Sweden.

KEY TO SPECIES

A. Stipules herbaceous, not united, separated by a quarter of the circumference of the stem.

Legumes compressed, scarcely if at all inflated, rather closely investing the 1–3 seeds, 5–13 mm. long.....1. *A. Chamissonis*

Legumes distinctly inflated, 8–40 mm. long; seeds more numerous and at maturity rattling about within the mature pod.

Pods evidently stipitate, the stipe 3–10 mm. long; pedicels becoming 5–7 mm. long; standard yellow.

Fruit distinctly pendulous.....2. *A. Pissisi*

Fruit strict or ascending.

Pods broadest above middle; leaves flat; flowering inflorescence short and dense.....3. *A. Edmonstonei*

Pods broadest below middle; leaves conduplicate; flowering inflorescence becoming loose and elongate.....4. *A. limariensis*

Pods sessile or with a stipe less than 3 mm. long.

Legumes small, 8–15 mm. long, usually strict or ascending.

Pedicels 3–5 mm. long at anthesis, becoming 5–7 mm. long in fruit; standard yellow; leaflets frequently verticillate.....5. *A. verticillatus*

Pedicels 0.5–1.5 mm. long at anthesis, becoming 1–2.5 mm. long in fruit; standard purple or violet; leaflets in simple pairs.

Herbage glabrous; leaflets thickish; plant montane.....6. *A. Looserii*

Herbage hairy; leaflets not very thick nor fleshy; plants of low altitudes.....7. *A. Berterianus*

Legumes medium to large, 15–40 mm. long.
Plants annual or at least short-lived; corolla pinkish; arid coastal regions of northern Chile.
Herbage pallid with a dense velvety indument...8. *A. paposanus*
Herbage green or somewhat cinereous, strigose.....
.....9. *A. coquimbensis*
Plant strongly perennial, montane.
Legumes strictly erect, lancoid, tough and rigid, opaque, lustrous brown at maturity.....10. *A. curvicaulis*
Legumes spreading and becoming pendulous, ovoid or ellipsoid, papery, translucent, pale or mottled at maturity.
Ovary and fruit glabrous.
Leaves glabrous or with the hairs confined to the margins and midrib of the leaflets....11. *A. pehuenches*
Leaves sparsely but evidently strigose.....
.....12. *A. valerianensis*
Ovary distinctly strigose and fruit at least sparingly so.
Corolla pinkish; flowers dense, 15–30; pods 15–20 (–25) mm. long, numerous and congested in globose clusters; northern Chile.....13. *A. vagus*
Corolla with at least the standard conspicuously purple or violet; pods not in dense clusters.
Leaflets smooth, strigose with closely appressed silky hairs; pods 2–4.5 mm. long.....
.....14. *A. Darumbium*
Leaflets somewhat shaggy with short ascending to spreading hairs; pods 2–3 cm. long.....
.....15. *A. monticola*

AA. Stipules mebranous, more or less united into an amplexicaul sheath.
B. Fruit with the sutures not inflexed nor recessive, or with the lower one more prominent than the upper.
Peduncles 2–15 cm. long, equalling or surpassing the subtending leaf; flowers numerous; Patagonia and the andes of middle and southern Chile and Argentina.
Fruit not compressed about the margin of the valves, the sutures not salient.
Plant densely short villous, the hairs more or less curly and spreading; leaflets obcordate, plicate; pods short villous...16. *A. vesiculosus*
Plant strigose to glabrous, hairs appressed; leaflets acute to weakly retuse, elliptic to lanceolate, revolute; pods mottled, prevailingly glabrous.
Leaflets more or less strigose above; wings conspicuously surpassing the keel.....17. *A. Arnottianus*
Leaflets glabrous above; wings shorter than the keel or of about equal length.....18. *A. palenae*
Fruit compressed at least about the margin of the valves, tough and leathery, the sutures prominent, elevated on the compressed rim of the fruit.
Pod somewhat compressed dorso-ventrally, more or less triangular in cross-section, lower suture most prominent; corolla ca. 12 mm. long, petals all broad; eastern Argentina.....19. *A. argentinus*
Pod flattened laterally, linear to lenticular in cross section, sutures equally prominent; corolla 15–20 mm. long, the petals narrow and elongate.
Plant villous, pallid; calyx with pale hairs; fruit valves wider than long.....20. *A. Illinii*

Plant short strigose or glabrous; calyx usually with black hairs; fruit valves longer than broad.

Leaflets elliptic to oblanceolate, apex rounded or emarginate. .....21. *A. Cruckshanksii*

Leaflets oblanceolate to linear, apex acute.

Stems elongate, 1–5 dm. long, internodes well developed, bearing scattered leaves; peduncles obviously axillary.....22. *A. Amunategui*

Stems short, usually 0.5–5 cm. long, slender, with very much shortened internodes; leaves appearing to be tufted and the peduncle scapose...23. *A. patagonicus*

Peduncles very short, 0–1.5 cm. long, conspicuously shorter than the subtending leaf, 1–7-flowered; high altitudes in Bolivia and northern Chile and Argentina.

Ovary glabrous; fruit glabrous, 10-15 mm. long; plant caespitose with green 2-6-jugate leaflets; peduncles 2–4 flowered, becoming 1–5 mm. long; northwestern Argentina.....24. *A. Burkartii*

Ovary strigose; fruit pallid, strigose, 4–7 mm. long; plants with dense appressed pale indument; leaflets 5–9-jugate.

Plant densely caespitose, the leaf-tufts usually springing from an evident collar of tough flavescent stipules; fruit subsessile, solitary, remaining hidden among stipular sheaths, 3–4 mm. long, valves 2–3 mm. broad; northern Argentina.....25. *A. crypticus*

Plant with elongating leafy stems, 1–15 cm. long; fruit becoming evident, 6–7 mm. long, valves 5–6 mm. wide.

Fruit usually solitary in the leaf-axils, becoming exposed along the older parts of the coarse trailing stems; northern Argentina and adjacent Chile.....26. *A. cryptobotrys*

Fruits several to many on evident axillary peduncles; peduncles 1-15 mm. long.

Plant coarse; leaflets lanceolate, 3–10 mm. long, apex acute; corolla 14 mm. long; valves broadest below middle; Bolivia.....27. *A. Asplundii*

Plant slender; leaflets oblong or elliptic, 3–4 mm. long, apex rounded or obtuse; corolla ca. 6 mm. long; valves broadest at or above the middle; Andes of Coquimbo and San Juan.....28. *A. bellus*

BB. Fruit with the lower suture inflexed, or at least less prominent than the upper one.

C. Fruit distinctly pendulous or reflexed.

D. Plants of Argentina.

Leaflets cuneate to deltoid, broadest at apex and very deeply and conspicuously emarginate; fruit 25–30 mm. long, falcate, upper edge convex in outline.....29. *A. tehuelches*

Leaflets linear to elliptic, broadest near middle, the apex acute to inconspicuously retuse; fruit with upper edge straight or concave in outline, except in *A. Ruiz-Lealii*.

Plant abundantly appressed villous, pallid, caespitose, the pods apparently short and not much surpassing the calyx; Chubut. .....30. *A. chubutensis*

Plant prevailingly short strigose, cinereous to green, stems elongated and slender, loosely branched; pods elongate.

Fruit plump, in cross-section more or less circular or elliptic, valves distinctly convex, lower suture depressed in a shallow narrow groove; corolla ochroleucous and merely spotted with blue or purple.

Valves swollen on either side of the dorsal suture, the suture appearing to be inflexed, pods becoming leathery or somewhat woody; central and northern Argentina.....31. *A. distinens*

Valves not swollen on either side of the dorsal suture, the suture prominent its whole length, pods less tough and more elongate; northern Patagonia.....32. *A. Bergii*

Fruit angular and more or less laterally compressed, in cross section more or less sagittate or cordate to triangular, valves plane on the sides, lower suture inflexed.

Corolla 8–14 mm. long, bright colored; ovary and fruit glabrous.

Plant annual; fruit more than 6 times as long as broad; Rio Negro.....33. *A. Spegazzinii*

Plant perennial; fruit 2–4 times as long as broad.

Pod 10–18 mm. long, strongly and acutely triangular, lateral angles much more prominent than the lower suture; valves readily and completely separating at maturity; Mendoza and Cordoba.....34. *A. carinatus*

Pod 5–9 mm. long, lateral angles rounded and less acute than the lower suture; valves much tougher than in the last, very tardily if at all separating at maturity; Cordoba.....35. *A. Parodii*

Corolla 4–7 mm. long, coloring pale.

Inflorescence with numerous rather crowded flowers; stems elongate, 1–4 dm. long; northwestern Argentina.....36. *A. Joergensenii*

Inflorescence with few (2–7) distinctly scattered flowers; stems 1.5 dm. long or less.

Ovary glabrous; fruit oblong, valves 3–4 times as long as broad, upper suture straight or concave in lateral outline; leaflets glabrous above; Rio Negro and Chubut.....37. *A. pauranthus*

Ovary strigose; fruit falcate, valves 6–10 times as long as broad, upper suture convex in lateral outline; leaflets strigose above.....38. *A. Ruiz-Lealii*

DD. Plants of Chile.

Wings much shorter than the keel.

Fruit and ovary glabrous; plant prostrate, green; leaflets 6–9-jugate; Cautin.....39. *A. Monteroi*

Fruit and ovary strigose; plant prostrate or erect; leaflets 6–16-jugate; Concepcion north to Coquimbo.....40. *A. amatus*

Wings much surpassing the keel.

Leaflets 3; plant densely silky strigose....41. *A. valparadisiensis*

Leaflets 12–31.

Plant prostrate, stems slender and widely spreading; peduncles scarcely if at all surpassing subtending leaf; corolla large, standard 12–18 mm. long; coast of Antofagasta.....42. *A. cachinalensis*

Plant erect or decumbent; peduncles usually much surpassing the subtending leaf; corolla smaller, standard usually less than 12 mm. long.

Pod curved, lateral outline lunate with upper edge concave and the lower edge strongly convex, their sweeping curves continuing into the style, hence apex of pod gradually attenuate; Coquimbo to Antofagasta.

Fruit loosely and abundantly tomentose; plant perennial, stems 2–6 dm. long; leaflets 8–14-jugate; Coquimbo.....43. *A. nudus*

Fruit strigose to subglabrous; plant prevailingly annual; stems 1–4 dm. long; leaflets 5–10-jugate; Atacama and Antofagasta.....44. *A. Dodti*

Pod straight, in lateral outline more or less oblong, with the upper edge straight or convex and the lower edge more or less convex; style terminating the abruptly contracted apex of the fruit.

Fruit laterally much compressed, the lower suture narrowly and deeply inflexed, the sides of the pod nearly parallel; ovary usually hairy; leaflets usually rounded to acute at apex; coastal areas east to base of cordilleras.....45. *A. Berteri*

Fruit triquetrous, with three subequal faces, the lower suture medial on the flattish lower side; ovary glabrous; leaflets usually obtuse or retuse at apex; cordilleras.....46. *A. Germaini*

CC. Fruit strict or ascending, not pendulous.

E. Plants with elongating stems, not caespitose nor pulvinate.

Plant coarse; stipules very large and loosely sheathing, 5–10 mm. long; leaflets usually flat; fruit with well developed false septum.

Fruit evidently villous-strigose; corolla over 1 cm. long; plant usually erect; flowers usually projected beyond the leaves.....47. *A. Garbancillo*

Fruit inconspicuously strigose or glabrous; corolla 6–9 mm. long; plant spreading; flowers and fruit much surpassed by leaves.

Plant gray-green, evidently strigose; widely distributed.....48. *A. arequipensis*

Plant bright green, nearly glabrous, rare...49. *A. cryptanthus*

Plant slender; stipules small and not very conspicuous, usually less than 5 mm. long; leaflets usually folded or revolute.

Plants of Patagonia and the cordilleras south of Cerro Aconcagua (lat. 33° S).

Fruit slender and elongate, 1–2 cm. long, 2–2.5 mm. in diameter, with a nearly complete false septum and hence, practically 2-celled.....50. *A. Sanctae-Crucis*

Fruit short and stout, 5–15 mm. long, about half as wide as long, 1-celled, the false septum absent or weakly developed.

Leaves linear-lanceolate to narrowly oblong, apex acute to rounded; fruit becoming tough and rigid; Chile at the west base of the cordilleras.....51. *A. orthocarpus*

Leaves obcordate, strongly retuse at apex; fruit chartaceous.

Herbage green, leaflets glabrous or with only a few scattered hairs along the midrib; south of Neuquen and Talca.....52. *A. Domeykoanus*

Herbage cinereous, younger leaflets evidently strigose beneath; Mendoza.....53. *A. complicatus*

Plants from north of Cerro Aconcagua; with the exception of *A. triflorus*, a coastal annual of Peru and no. Chile, all from high altitudes in northwestern Argentina or the Bolivian plateau.

Fruit densely white villous-strigose, 4–5 mm. long, 2–4 seeded, false septum completely absent; corolla more or less marcescent and investing the ovary at maturity.....54. *A. punae*

Fruit not pallid, glabrous or somewhat strigose, usually 10 mm. long or more, 4–12-seeded; corollas not marcescent, soon deciduous.

Flowers small, standard 3–5 mm. long; fruit with the false septum absent or inconspicuous.

Inflorescence congested even in fruit; pods 2–3 mm. broad; prostrate perennials of high altitudes in Bolivia and Argentina.....55. *A. micranthellus*

Inflorescence becoming racemose; pods 5–6 mm. broad; erect annual of coastal Peru and no. Chile. .....56. *A. triflorus*

Flowers larger, standard 5–9 mm. long; fruit with a narrow incomplete false septum.

Plant cinereous, conspicuously short-strigose; leaves usually shorter than the internodes; leaflets thickish, rounded or obtuse at apex.....57. *A. Famatinae*

Plant green, glabrous or only sparsely strigose; leaves usually much surpassing the internodes; leaflets less firm and usually strongly retuse at apex.

Ovary and fruit distinctly strigose; northwestern Argentina and adjacent Bolivia.....58. *A. tarijensis*

Ovary and fruit glabrous or practically so; Argentina to Peru, rare.....59. *A. Weddellianus*

EE. Plant caespitose or decidedly pulvinate, leaf-bearing stems very short and not much elongating, usually less than 1 cm. long or if longer then compacted into very dense pulvinate masses (cf. alpine forms of *A. micranthellus* and *A. tarijensis*).

Plant rhizomatose; fruit 7–13 mm. long, 4–7 mm. wide, strongly flattened laterally, intrusion of lower suture and the false septum largely confined to the attachment-end of pod.....60. *A. Bustillosii*

Plant without rhizomes.

Flowers pedicellate, the pedicels 1–4 mm. long, at anthesis elevating the flower above its subtending bract; peduncles usually evident at anthesis, up to 4 cm. long.

Herbage glabrous or practically so; flower solitary; fruit completely 2-celled by a tough false septum (cf. *A. Weddellianus*).....61. *A. uniflorus*

Herbage evidently hairy; flowers clustered; fruit 1-celled, the false septum membranous and incomplete or absent.

Plant yellowish green; calyx-lobes with black hairs; leaflets 3–4-jugate; peduncles 1–3-flowered; ovary glabrous; caudex rather coarse.....62. *A. Venturii*

Plant pallid, frequently somewhat silvery strigose; calyx usually with only pallid hairs.

Ovary and fruit glabrous; leaflets 2–4-jugate; stems with internodes 2–5 mm. long; fruit with an incomplete false septum.....63. *A. confinis*

Ovary and fruit strigose; stems with shorter internodes.

Leaflets lanceolate to narrowly ovate, 2–3 mm. broad, 4–6-jugate; fruit somewhat lunate, 10–15 mm. long and 3–5 mm. high; false septum completely absent.....64. *A. hypsogenus*

Leaflets linear, 1–2 mm. broad, 2–3-jugate; fruit oblong, 6–8 mm. long and 2–4 mm. high, false septum narrow but evident.....65. *A. crymophilus*

Flowers sessile or subsessile, at anthesis base of calyx closely ensheathed by its bract; peduncles extremely short or none (in fruit rarely becoming 3–7 mm. long in *A. minus* and *A. Werdermanni*).

Flowers 4–8, in sessile subumbellate clusters in the leaf-axils, intermixed with large bracts.

Leaflets elliptic to suborbicular, loosely clothed with non-lustrous hairs, usually glabrescent in age, apex truncate to deeply emarginate; stipules white, papery, very broad and loose, usually deciduous.....66. *A. pusillus*

Leaflets ovate to lanceolate, densely and permanently clothed with lustrous hairs, apex acute or obtuse.

Herbage strigose, the hairs ca. 1 mm. long; corolla ca. 6 mm. long; Bolivia and Argentina.....67. *A. Urbanianus*

Herbage appressed villous, the hairs ca. 2 mm. long; corolla ca. 8 mm. long; Central Peru.....68. *A. Dillinghami*

Flowers solitary or geminate in leaf-axils; bracts relatively inconspicuous.

Fruit with a more or less incomplete membranous false septum; valves rather firm and tough.

Leaves canescent or silvery, abundantly appressed villous even in age, not glabrescent; stipules broad and coarse, 5–7 mm. long; leaf-bearing stems coarse, usually 2–3 mm. thick.....69. *A. peruvianus*

Leaves green or cinereous, hairs scattered or disappearing in age and frequently absent on the upper surface; stipules smaller, 2–4 mm. long; leaf-bearing stems slender, 1–1.5 mm. thick.

Leaflets very broadly obcordate with a deeply emarginate apex, strongly folded, sparsely strigose with the hairs lying oblique to the midrib.....70. *A. Werdermanni*

Leaflets orbicular to elliptic or lanceolate, involute-plicate, apex rounded or very weakly and obscurely emarginate, hairs paralleling midrib.

Leaves appressed short-villous, the hairs loosely appressed particularly on the rhachis, projecting beyond the leaflet-apex in a definite penicillate tuft; stems short and congested, frequently subpulvinate.....71. *A. minutissimus*

Leaves strigose with shorter more appressed hairs which scarcely, if at all, protrude beyond the leaflet-apex; stems elongating, forming prostrate mats.....72. *A. minimus*

Fruit without any false septum, valves rather thin and fragile.

Plant distinctly pulvinate, the leaves strongly marcescent and persisting on even the oldest stems; young stems slender and elongate, internodes 1–10 mm. long; stipules small, not imbricate; pods 4–5 mm. long, several-seeded; Argentina.....73. *A. pulviniformis*

Plant caespitose, the leaves very much less persistent; annual growth of stems short, internodes shorter than the stipules; stipular sheaths imbricate and clothing the stem; pods usually 2 mm. long and 1–2-seeded.

Stipules with ciliate margins, back glabrous or practically so even when young; calyx-tube cupulate, sparsely strigose.

Caudex dense, a mass of crowded strict stems and branches intermixed with persistent leaf-remnants; stipules albescent.....74. *A. Reichei*

Caudex a loose mass of spreading stems and branches, these more or less rope-like and covered with tightly sheathing stramineous stipules, old leaves rather promptly deciduous.....75. *A. flavocreatus*

Stipules broader and more loosely sheathing, with numerous appressed hairs at least when young; calyx-tube cylindric, densely appressed villous.

Herbage with non-lustrous indument; stipules papery, albescent; standard with obovate blade; Bolivia and northern Argentina.....76. *A. deminutivus*

Herbage with lustrous indument; stipules firmer in texture and darkening in age; standard with a suborbicular blade; Central Peru.....77. *A. Dielsii*

1. **Astragalus Chamissonis** (Vogel) Reiche, Anal. Univ. Chile 97: 553 (1897), and Fl. Chile 2: 96 (1898).

Phaca ochroleuca Hooker & Arnott, Bot. Misc. 3: 186 (1832). — Type collected at Valparaiso, *Cuming 389*.

Astragalus ochroleucus (H. & A.) Gray, Bot. U. S. Explor. Exped. 1: 413 (1854). Not Gilibert (1782).

Phaca Chamissonis Vogel, Linnaea 10: 592 (1836). — Type collected between Talcahuano and Concepcion, *Chamisso*.

Phaca chilensis Nees, Del. Sem. Hort. Vratislav. (1833), and Linnaea 10: Litt. 72 (1836). — Described from garden material; perhaps from seeds originally sent to Europe from Chile by Bertero.

Astragalus chilensis (Nees) Reiche, Anal. Univ. Chile 97: 111 (1897), and Fl. Chile 2: 111 (1898), not Sheldon (1894).

Astragalus placens Clos in Gay, Fl. Chile 2: 109 (1846). — Type collected near Valparaiso, *Gay 467*.

Astragalus ovallensis Clos in Gay, Fl. Chile 2: 110 (1846). — Type collected in "los arroyos del departmento de Ovalle," *Gay 491*.

Astragalus Volckmanni Philippi, Anal. Univ. Chile 18: 46 (1861), and Linnaea 33: 45 (1864); Reiche, Anal. Univ. Chile 97: 547 (1897), and Fl. Chile 2: 90 (1898). — Type collected at Camarones, southern Atacama, *Volckmann*.

Phaca araucana F. Philippi, Anal. Univ. Chile 84: 14 (1893). — Type from sands near sea north of Rio Tolten, prov. Cautin, *F. Philippi*.

Astragalus araucanus (F. Phil.) Reiche, Anal. Univ. Chile 97: 557 (1897), and Fl. Chile 2: 101 (1898).

Astragalus monospermus Philippi, Anal. Univ. Chile 84: 27 (1893); Reiche, Anal. Univ. Chile 97: 552 (1897), and Fl. Chile 2: 95 (1898). — Type from Las Trancas near Angol, 1881.

Astragalus laetevirens Philippi, Anal. Univ. Chile 84: 30 (1893); Reiche, Anal. Univ. Chile 97: 553 (1897), and Fl. Chile 2: 96 (1898). — Type collected at Laja, Bio Bio, *Rahmer*.

RANGE: Widely distributed in central Chile, extending from the southern parts of Atacama south to Cautin, on hills near the coast and at lower altitudes in the Cordillera.

CHILE: Atacama: Camarones, *herb. Reed* as *A. Volckmanni* (K). Coquimbo: Coquimbo, *ex Philippi* as *P. ochroleuca* (US, K); La Serena, 1930, *Claude Joseph 5446* (US); El Molle, 30 km. west of Vicuña, marsh land along Coquimbo River, 400 m. alt., 10–16 dm. tall, fl. white-yellow or pink, *Wagenknecht 18495* (G); Queb. Arrayan, 25 km. south of Estacion Pelicana, 5 dm. tall, fl. yellow-white and violet, *Wagenknecht 18109* (G); ravines of the dept. Ovalle, *Gay 491* (type of *A. ovallensis*, Paris). Aconcagua: Valparaiso, *Cuming 389* (type of *P. ochroleuca*, K, BM); Valparaiso, *Wilkes Exped.* (US); hills near Valparaiso, *Bertero 824* (G, Del, Paris); Popaico near Valparaiso, Feb. 1829, *Gay 467* (type of *A. placens*, Paris). Santiago: Cord. de Santiago, *ex Philippi* as *P. ochroleuca* (BD, Boiss). Colchagua: Cord. de Tinguiririca, 2300 m. alt., 1929, *Pirion 73* (G). Curico: Nacimiento del Teno, Feb. 1896, *Philippi* (G). Maule: Baños de Longavi, Jan. 1888, *Schoenemann* (G); Valle del Maule superior, Cord. Linares, Jan. 1897, *Reiche* as *A. laetevirens* (FM, BD). Nuble: trail to Volcan Antuco, *herb. Reed* as *P. ochroleuca* (K); Cord. de Chillan, *Germain* (K, BM, Del, Boiss), Valle del Renegado, Jan, 1877, *ex Philippi* as *A. Chamissonis* (Speg). Concepcion: La Vega de Concepcion, *Poeppig 97 70* (BD); Concepcion, *D'Urville* (BD), and *Cuming 810* (K); between Talchaguano and Concepcion, *Chamisso* (type of *A. Chamissonis*, BD); Coronel, 1860, *Ochsenius 444* (BD); Itata, Jan. 1878, *ex Philippi* as *P. chilensis* (Speg). Bio-Bio: Valle Renaico, 1897, *Neger* (Munich); San Ignacio de Pemehue, Jan. 1894, *Philippi* (G); Ercilla, Feb. 1892, *Kuntze* as *T. canescens* (NY). Cautin: Budi, Jan. 1923, *Claude-Joseph 1879* (US, NY).

This slender erect-growing fruticose species varies from glabrescent to very densely strigose. The plants with the densest indument come from the province of Concepcion and are the typical form of *A. Chamissonis*. Philippi's *A. monospermus* appears to be this densely strigose form. Plants from beyond the province of Concepcion are much more sparingly strigose and some of these become glabrescent in age. I do not believe

that practicable segregates of this species can be found upon degree of pubescence. The older writers often used greek letters to distinguish this variation. *Phaca ochroleuca* var. β of Hooker & Arnott, l.c., is based upon *Cuming 810* from Concepcion. It is typical *A. Chamissonis*. At Paris Clos has labeled *Gay 586 h. Ch.*, from "Chile," as the var. β and has appended a note which probably indicates the source of his var. δ. "Les deux echantillons de *Phaca ochroleuca* H. et Arn. dans l'herbier Webb sont differents en ce qu'un est glabre et l'autre est tomenteus." The var. β of *A. placens*, Clos. l.c. 109, is based upon *Bertero 824* from Valparaiso.

The inadequately described *P. chilensis* Nees, appears to belong to the present species. At Munich there is a good specimen of our present plant associated with a label reading "Phaca chilensis — hort Monoc. — 1838." A similar specimen at Berlin has a label, in three different scripts, which may be indicated as follows. "714 — Dalea? e Chile — *var. dubia OK* — HORT. BOT. BEROL. — 31."

2. **Astragalus Pissisi** (Phil.), comb. nov.

Phaca Pissisi Philippi, Anal. Univ. Chile 18: 46 (1861), and Linnaea 33: 45 (1864). — Given as based upon material from "Chañerel in prov. Coquimbo, Volckmann; radix borealis montis de Chacabuca, ipse."

Astragalus canescens var. *Pissisi* (Phil.) Reiche, Anal. Univ. Chile 97: 555 (1897), and Fl. Chile 2: 98 (1898).

RANGE: Hills south of the Rio Aconcagua and north of Santiago; reported from northwestern Coquimbo.

CHILE. Coquimbo: Chañaral, herb Reed as *P. Pissisi* (K). Aconcagua: Montenegro, 1884, *Borchers* (BM, FM). Santiago: Chacabuco, fl. white, *ex Philippi* as *P. Pissisi* (BD, Del, Boiss, Stock); Cuesta de Chacabuca, 1500 m. alt., 1935–36, *Grandjot* (G); near Colina, fl. white, Sept. 1861, *ex Philippi* as *P. Pissisi* (BD, Del).

One of the collection upon which Philippi originally based this very distinct species is labeled as having come from Chañaral, in northwestern Coquimbo. Subsequently, however, the species has been found only in the region about Chacabuca Pass, to the north of Santiago. I suspect that the specimen said to have come from Coquimbo may have been mislabeled.

The coarse flower, the elongate pedicels, and the large papery long-stiped pendulous pods are outstanding characteristics of this species. It is very distinct but probably has its closest relative in *C. limariensis* from which it differs in its coarser flowers, more papery pendulous pods and broader flat closely strigose leaflets.

3. **Astragalus Edmonstonei** (Hook.) Robinson, Proc. Am. Acad. 38: 148 (1902).

Phaca flava Hooker & Arnott, Bot. Misc. 3: 186 (Aug. 1832). — Type collected at Valparaiso, *Cuming 611.*

Astragalus flavus (H. & A.) Sheldon, Minn. Bot. Studies 1: 158 (1894); Reiche, Anal. Univ. Chile 97: 564 (1897), and Fl. Chile 2: 107 (1898). Not Nuttall (1840).

Phaca chrysantha Moris, Mem. Accad. Torino 25: 104, t. 4 (1834). — Based upon plants cultivated at Turin, evidently grown from seed collected by Bertero.

Astragalus chrysanthus (Moris) Reiche, Anal. Univ. Chile 97: 565 (1897), and Fl. Chile 2: 108 (1898). Not Boiss. & Hohen. (1849).

Astragalus affinis Steudel, Nom. ed, 2, 1: 159 (1840), nomen. — Based upon material from near Quintero, *Bertero 821*.

Phaca Edmonstonei Hooker, Trans. Linn. Soc. London 20: 227 (1847). — Based upon collections incorrectly labeled as from the Galapagos Islands, *Edmonstone*.

Phaca podocarpa Philippi, Anal. Univ. Chile 84: 22 (1893), nom. provis.; Reiche, Anal. Univ. Chile 97: 564 (1897), and Fl. Chile 2: 107 (1898). — Based upon material from Concon. Not Meyer (1831).

Phaca acutidens Philippi, Anal. Univ. Chile 84: 16 (1883); Reiche, Anal. Univ. Chile 97: 564 (1897), and Fl. Chile 2: 107 (1898). — Type from near mouth of the Rio Maule, *P. Ortega*.

Astragalus Hohenacheri Spegazzini, Anal. Mus. Nac. Buenos Aires II, 4: 265 (1902) — A renaming of *A. flavus* (H. & A.) Reiche.

RANGE: Central Chile along the coast.

CHILE. Aconcagua: in pascuis arenosis maritimis, Quintero, fl. flavi, "Yerba loca," Jan. 1830, *Bertero 821* (Paris, type of *A. affinis*; NY); Quintero, *Werdermann 15* (G, US, BM, BD); in arenosis maritimis ad Quintero et Concon, *Poeppig 199/161* (BM, BD, Geneva, Paris); Concon, Oct. 1884, *Philippi* as *P. podocarpa* (G); Reñaca, March 1916, *Jaffuel 666* (G); Valparaiso, *Buchtien* (BD, US); Valparaiso, 1831, *Cuming 611* (K, type of *P. flava*). Maule: Constitucion, Oct. 1892, *Reiche* (G). Indefinite: Chile, in arenosi, frequens, Sept. 1831, *Gay 438* (Paris); Chile, *Bridges 42* and *43* (K), *44* (BD); "Charles Island, Galapagos," *Edmonstone* (K, type of *A. Edmonstonei*; G).

I have seen specimens of this readily recognizable species from Quintero, Concon, Reñaca, Valparaiso and Constitución. Of the synonyms listed I have seen authentic material of all but *P. acutidens*. All clearly belong to the unmistakable species treated here.

Though originally given as from the Galapagos Islands, the collection by Edmonstone which is the type of *P. Edmonstonei* is unquestionably the present Chilean plant. Edmonstone was the botanist on the cruise of the *Herald* during which visits were made in Chile (Valparaiso and Concepcion) and Peru as well as on the Galapagos Island. His collections became confused after his untimely death in Ecuador in 1846. It may be noted that the other Galapagean records for *Astragalus* are also based upon falsely labeled specimens. The collection by Du Petit-Thouars, mentioned by Hooker when he described *P. Edmonstonei*, represents flowering material of *A. Menziesii* Gray, probably from Monterey, California. *Astragalus brevidentatus* Wright, Kew Bull. 200 (1906), also attributed to the Galapagos, is certainly this Californian plant. Cf. Johnston Jour. Arnold Arb. 19: 95–96 (1938).

4. **Astragalus limariensis** Muñoz, Jour. Arnold Arb. 20: 246, t. 1 (1939). — Type from Fray Jorge, *Muñoz 2*.

RANGE: Known only from the valley of the Rio Limari, prov. Coquimbo, Chile.

CHILE. Coquimbo: Fray Jorge, Sept. 26, 1939, *Muñoz 2* (G, type); Fray Jorge, low hills near the buildings of the estancia, Sept. 26, 1939, *Muñoz B 94* (G); west of Ovalle, Sept. 19, 1917, *Baeza* (G).

A well marked species probably most closely related to *A. verticillatus* of south central Chile. It agrees with its relative in gross habit, flower shape and size, inflorescence, and narrow elongate leaflets, but differs in its much larger, differently shaped and distinctly stiped pod.

5. **Astragalus verticillatus** (Phil.) Reiche, Anal. Univ. Chile 97: 543 (1897), and Fl. Chile 2: 86 (1898).

Phaca verticillata Philippi, Anal. Univ. Chile 84: 15 (1893). — Based upon material from Araucania, *Philippi* in 1887, and from Constitucion, *Reiche*.

Phaca brachytropis Philippi, Anal. Univ. Chile 84: 15 (1893). — Type from San Javier, prov. Maule, *P. Ortega*.

Astragalus brachytropis (Phil.) Reiche, Anal. Univ. Chile 97: 544 (1897), and Fl. Chile 2: 87 (1898). Not Meyer (1831).

Astragalus maulensis Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902). — Based upon *A. brachytropis* Reiche, not Meyer.

RANGE: In and along the coastal hills of Chile from Constitucion and Talca southward into northern parts of the province of Concepcion.

CHILE: Talca: Talca, *ex Philippi* as *P. brachytropis* (BD). Maule: Empedrado, Sept. 18, 1892, *Reiche* (G); Villa Alegre de Loncomilla, Oct. 24, 1931, *Espinosa* (G). Concepcion: Penco near Concepcion, Oct. 1896, *Neger* (Munich); Araucania, Nov. 1887, *Philippi* as *P. verticillata* (isotype, G, BM.)

The type of *P. verticillata* is given as collected in Nov. 1887, in "Araucania." It is very similar to the material from Penco collected by Neger. Both specimens have flower but lack fruit. The leaflets are geminate and very slender. During his "Botanische Excursion in das Araukanerland" in Nov. 1887, cf. Bericht. Ver. Naturk. Kassel vol. 41 (1896), Philippi visited San Javier, Concepcion, Angol, Traiguen and Temuco. Accordingly his type collection of *A. verticillatus* could have originated in the vicinity of Concepcion where Neger collected specimens very much resembling it.

The material I have seen from the watershed of the Rio Maule is coarser and has less slender leaflets than represented in the type of *A. verticillatus* and in Neger's plant from near Concepcion. This more northern material is that described as *P. brachytropis* upon the basis of a plant from San Javier, prov. Maule. Its leaflets are usually in pairs along both sides of the leaf-rhachis but in one collection from Talca, agreeing in all other details with the species, they are solitary along the rhachis.

The species is evidently related to *A. Pissisi* with which it agrees in such distinctive details as color, size, and structure of the corolla and unusually elongate pedicels. It differs from its relative in having much smaller (5–10 mm. long), globose or ovoid pods, that are sessile in the calyx (not stiped) and borne on erect pedicels. The pods bear scattered appressed usually pale hairs. They are usually abruptly contracted at the base. Philippi describes *P. verticillata* as having corollas in which the wings are short and only half the length of the keel. This is evidently a mistake. Authentic material of the species shows the corollas to be like those of *P. brachytropis* which he properly described as having wings almost twice as long as the keel. Reiche so described them in his Flora de Chile.

6. **Astragalus Looserii,** sp. nov.

Planta perennis; caulibus pluribus erectis sparse stricteque ramosis 3–10 dm. altis fistulosis (basim versus 3–5 mm. crassis) apicem versus sparse inconspicueque fusco-strigosis alibi glabrati; foliis glaberrimis concoloribus viridibus, rhachibus 7–15 cm. longis ascendentibus, foliolis crassiusculis

10–12-jugatis 1–2.5 cm. longis 2–4 mm. latis paulo supra medium latioribus apice obtusis vel subtruncatis basi attenuatis; stipulis liberis triangularibus; pedunculis (partibus floriferis inclusis) 15–30 cm. longis foliis duplo longioribus; floribus laxe racemosis (racemis saepe 10–15 cm. longis) stricte ascendentibus; calycibus pilis nigris brevibus abundantibus vestitis, tubo cupulato 2–2.5 mm. longo, lobis subulatis ca. 2 mm. longis, pedicellis ca. 1 mm. longis; corolla 1 cm. longa purpurea vel violacea; leguminibus ascendentibus vel rariter plus minusve recurvatis ca. 1 cm. longis inflatis leviter lateraliterque compressis sparse nigro-strigosis apice acutis basi rotundis vel obtusis infra medium crassioribus.

RANGE: Cordilleras of Santiago, Aconcagua and Coquimbo.

CHILE. Santiago: Fierro Carrera, Las Condes, much branched, up to 1 m. tall, fl. reddish, 2800 m. alt., Jan. 1930, *Gualterio Looser 1132* (type, Gray Herb.); Fierro Carrera, albino form, Jan. 1930, *Looser 1133* (G); Mina de la Disputada, Cord. de las Condes, 3500 m. alt., Dec. 1930, *Father Denys Le Manchee 256* and *257* (G); Las Condes, *herb. Reed* (BM); Cord. de Santiago, Feb. 1870, *Reed* as *P. elata* (K); Cord. de Santiago, *ex Philippi* as *P. Berteriana* (K); Cord. de Santiago, *ex Philippi* as *P. elata ?* (BD, Del); Cord. de Santiago, Jan. 1873, *ex Philippi* as *P. elata* (Speg). Aconcagua: Rio Sobrante, above Chincolco, in vega, 2700 m. alt., fl. blue-white, *Morrison 17323* (G). Coquimbo: Fraguitas, Dec. 1874, *Germain* (G); La Molloca, Cord. de Illapel, Jan. 1888, *ex Philippi* as *P. elata* (BM); Rio Rapel, Higuera, Agua Amarilla, *herb. Reed* as *P. elata* (BM); Rio Rapel, *Reed* (G); bed of the river of San Isidro [Vicuña], stems 5–7.5 dm. tall, 600 m. alt., 1836, *Gay 363* in pt. (Paris); Chile, *Gay 876* in pt. (Paris); Chile, *Gay* as *P. elata* (K, BD, Del).

A species evidently related to *A. Berterianus* and one resembling that species in habit of growth, and size, shape and structure of fruit. The new species is a plant of the cordilleras. Its relative belongs to the valleys and coastal hills and is quickly distinguished from the montane plant by a less robust habit, conspicuously hairy herbage, and smaller, less juicy leaflets. *Astragalus Looserii* is best known from the mountains east of Santiago. Philippi and Reiche seem to have confused it with the very different *A. curvicaulis*. I have been unable to separate the plants of the cordilleras above Santiago from some that come from the cordilleras further north in Coquimbo. The four sheets at Paris collected by Gay and determined by Clos as *P. elata* contain varying mixtures of three species. The predominating plant, however, is the northern form of *A. Looserii*.

7. **Astragalus Berterianus** (Moris) Reiche, Anal. Univ. Chile 97: 555 (1897), and Fl. Chile 2: 98 (1898).

Phaca canescens Hooker & Arnott, Bot. Misc. 3: 185 (1832). — Type from Valparaiso, *Cuming 735*.

Astragalus canescens (H. & A.) Gray, Bot. U. S. Explor. Exped. 1: 412 (1854); Reiche, Anal. Univ. Chile 97: 555 (1897), and Fl. Chile 2: 98 (1898). Not DeCandolle (1802).

Phaca Berteriana Moris, Mem. Accad. Torino 37: 105, t. 26 (1834). — Type grown in the Botanic Garden at Turin from seeds collected by Bertero.

Astragalus oblongifolius Clos in Gay, Fl. Chile 2: 109 (1846). — Type collected along the Rio Cachapoal, Oct. 1828, *Bertero 60*.

Astragalus sphaerocarpus Clos in Gay, Fl. Chile 2: 119 (1846). Not Desfontaine (1840). — Type collected in the streets of Santiago, Sept. 1829, *Gay 498*.

Astragalus placens var. *oblongifolius* (Clos) Reiche, Anal. Univ. Chile 97: 552 (1897), and Fl. Chile 2: 95 (1898).

Phaca laxiflora Philippi, Anal. Univ. Chile 84: 17 (1893). — Type collected near Los Andes.

Astragalus laxiflorus (Phil.) Reiche, Anal. Univ. Chile 97: 556 (1897), and Fl Chile 2: 99 (1898). Not Fischer (1853).

Phaca dolichostachya Philippi, Anal. Univ. Chile 84: 21 (1893). — Type from sandy places near Concon, Oct. 1884, *F. Philippi.*

Astragalus dolichostachys (Phil.) Reiche, Anal. Univ. Chile 97: 556 (1897), and Fl. Chile 2: 99 (1898).

Phaca dissitiflora Philippi, Anal. Univ. Chile 84: 25 (1893). — Type collected at 1700 m. in the valley of the Rio Colorado in Jan. 1888.

Astragalus laxiflorus var. *dissitiflora* (Phil.) Reiche, Anal. Univ. Chile 97: 556 (1897), and Fl. Chile 2: 99 (1898). Not Bunge (1859).

Astragalus aconcaguensis Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902). A new name from *A. laxiflorus* Reiche, not Fischer.

CHILE. Coquimbo: Caimanes, Oct. 1935, *Espinosa* (G); Andocollo, Oct. 1926, *Claude-Joseph 4532* (US). Aconcagua: Cord. de Norte Ligua, 1902, *Castillo* (G); Quintero, *Werdermann 24* (G, US, BM, BD); Concon, dunes, Oct. 12, 1884, *Philippi* (G, isotype of *P. dolichostachya*); between Concon and Quintero, Oct. 1928, *Guenther & Buchtien* (Stock); Reñaca, sand hills, 1832, *Bridges 46* (K); Valparaiso, 1831, *Cuming 735* (K, type of *P. canescens*); Valparaiso, *Cuming 734* (K) and *736* (BM), *King* (K) and *Bridges* (BM); San Felipe, 1926, *Claude-Joseph 3846* and *3850* (US); Santa Rita, 1879, *ex Philippi* as *P. Berteriana* (Speg). Santiago: Colina, 1825, *Macrae* (K); Colina, Oct. 1887, *ex Philippi* as *P. Berteriana* (BM); Chacabuco, *ex Philippi* as *P. Berteriana* (BD); Lampa, *Reed* (K); Lampa, Nov. 1861, *ex Philippi* as *P. Berteriana* (Speg); Tiltil, dry sunny slope, 700 m. alt., *Looser 728, 737* and *785* (G), *Montero 149* (G); between Tiltil and Cuesta da La Dormida, 700–1200 m. alt., Oct. 1927, *Looser 784* (G); streets in Santiago, Sept. 1829, *Gay 498* (type of *A. sphaerocarpus,* Paris); Cajon del Maipo, *Philippi* as *P. canescens* (BD); near the Rio Maipo, May 1828, *Bertero 66* (Paris); Rio Colorado, Jan. 1888, *Philippi* (G, isotype of *P. dissitiflora*); Renca, Oct. 1876, *ex Philippi* as *P. Pissisi* (Speg). Colchagua: near the Rio Cachapoal, Oct. 1828, *Bertero 66* (Paris, type of *A. oblongifolius;* Del). Nuble: Cord. de Chillan, *Philippi* as *P. canescens* (BD). Talca: Curico, Jan. 1928, *Claude-Joseph 5230* (US).

The type of *A. Berterianus* was grown in Italy from seeds sent by Bertero from Chile. Since Bertero seems to have made only two collections of this species, one near the Rio Maipo in May, 1828 and another near Rancagua along the Rio Cachapoal in Oct. 1828, one of these, probably the former, is the source of the seed he sent to Turin. The latter collection supplied the type of *A. oblongifolius* Clos.

This species varies in the amount of dark hairs on the inflorescence, calyx and fruit. Some plants have a minimum of dark hairs and are light in color, as in the type of *P. canescens.* The color of indument shows no geographical correlation.

8. **Astragalus paposanus** Johnston, Contr. Gray Herb. 85: 51 (1929). — Type from quebrada above Agua Perales, near Paposo, *Johnston 5586.*

RANGE: known only from the vicinity of Paposo and Taltal.

CHILE. Taltal: Quebrada Anchuña, Sept. 1936, *Montero 2982* (G); Quebrada Guanillo above Agua Perales, near Paposo, Dec. 8, 1925, *Johnston 5586* (type, G); between Paposo and Punta del Rincon, Nov. 30, 1925, *Johnston 5564* (G); slopes above El Rincon, dryish ridge above fertile belt, Dec. 7, 1925, *Johnston 5498* (G).

Very closely related to *A. coquimbensis* and perhaps simply an outlying northern form characterized by a velvety pallid indument.

9. **Astragalus coquimbensis** (H. & A.) Reiche, Anal. Univ. Chile 97: 566 (1897), and Fl. Chile 2: 109 (1898).

Phaca coquimbensis Hooker & Arnott, Bot. Misc. 3: 184 (1832). — Type given as from Coquimbo, *Cuming 864*.

Phaca atacamensis Philippi, Anal. Univ. Chile 84: 16 (1893). — Type collected at La Brea, Atacama Desert. 1884, *San Roman*.

Phaca carrizalensis Philippi, Anal. Univ. Chile 84: 21 (1893). — Type collected near Carrizal Bajo, Atacama, T. King.

Astragalus vasticola Johnston, Contr. Gray Herb. 85: 51 (1929). — Based upon *Phaca atacamensis* Phil., not *A. atacamensis* Fries (1905).

RANGE: Deserts along the coast from Coquimbo north towards Taltal.

CHILE. Coquimbo: Coquimbo, *Cuming 864* (type of *P. coquimbensis*, K); Coquimbo, *ex Philippi, no. 221*, as *P. coquimbensis* (BD). Atacama: Carrizal Bajo, *herb. Reed* as *P. carrizalensis* (isotype of *P. carrizalensis*, K); near Pique Mostasa, Totoral, 200 m. alt., *Werdermann 468* (G, K, BD); between Monte Amargo and Caldera, 50 m. alt., *Werdermann 1636* (BD); Playa Caldera, cerca Morro, Nov. 1936, *Espinosa* (G); near Caldera, *Gigoux* (G); between Caldera and Queb. de Leon, 10 m. alt., *Werdermann 1638* (G, BD); Chañaral, Sept. 1909, *Reiche* (G); Aguada Grande, *Johnston 5824* (G, K); indefinite locality, *Geisse 122* (NY); and *Morong 1283* (NY). Antofagasta: Aguada Cachina, *Johnston 5739* (G, K).

An annual species of the coastal desert of northern Chile. It has evident relations only in the closely related *A. paposanus*.

10. **Astragalus curvicaulis** (Clos) Reiche, Anal. Univ. Chile 97: 559 (1897), and Fl. Chile 2: 102 (1898).

Phaca elata Hooker & Arnott, Bot. Misc. 3: 185 (1832). — Type from the "Cordillera of Chile" (probably from the upper Aconcagua Valley), *Cuming 224*.

Astragalus elatus (H. & A.) Reiche, Anal. Univ. Chile 97: 557 (1897), and Fl. Chile 2: 100 (1898). Not Boiss. & Bal. (1859).

Phaca curvicaulis Clos in Gay, Fl. Chile 2: 102 (1846). — Type from "Central Chile" (probably cordilleras of Coquimbo), *Gay*.

RANGE: Higher cordilleras of Aconcagua and Coquimbo and the high coast-ranges east of Limache in the prov. Santiago.

CHILE. Santiago: Las Vizcachas, coast ranges about 8 km. east of La Dormida, 1400–1500 m. alt., open slope, *Morrison 16819* (G). Aconcagua: Ojos de Agua, *Cruckshank 92* (K); Juncal, 2200 m. alt., *Buchtien* (G, US, BM, BD); Juncal, 2300–2400 m. alt., 1925, *Pennell 12975* (G); Rio Blanco, 1950 m. alt., Nov. 1927, *Elliott 234* (K); Los Andes to Uspallata Pass, *Moseley* (K, BM); cordilleras, *Cuming 224* (type of *P. elata*, K); locality indefinite, *Bridges 40* (K, BM); locality indefinite, 1839, *John Style* (Del). Coquimbo: Caren, Queb. Luncuman, 40 km. n. e. of Illapel, ca. 1000 m. alt., in gravel, fl. lavender, *Worth & Morrison 16496* (G); prov. Coquimbo, *Gay 876* in part (Del); locality indefinite, *Gay* as *P. curvicaulis* (type of *P. curvicaulis*, Paris; G, K, BD, Del).

The type of *P. curvicaulis* at Paris is given as collected by Gay, but has no number, collection-date, nor locality. It seems very similar to part of *Gay 876* which consists of a mixture of *A. Looserii* and this species. No locality is given for *Gay 876* at Paris, but at Geneva it is labeled as from the province of Coquimbo. Since Gay does not appear to have collected in the upper Aconcagua valley, which seems to be the southern limit of the species, it seems probable that he must have obtained his material in the cordillera east of Ovalle or Coquimbo. The type of *P. elata* is simply given as from the Cordilleras of Chile. Cuming, its collector, is known to have collected in the upper Aconcagua valley where the species is best

known, and it is practically certain that his material must have come from that area. The var. β mentioned by Hooker & Arnott, l.c., based upon *Cuming 734* represents *A. Berterianus*. The present species is a very distinct one, unique in its firm strict elongate lanceoid pods. It has been confused with *A. Looserii* but is readily distinguished from that species by its much larger more inflated and rounded fruit, smaller flowers, scanty short pale, rather than dense conspicuous black indument on the ovary, fruit and calyx, and cinereous rather than green juvenile leaves.

11. **Astragalus pehuenches** Niederlein in Roca, Exped. Rio Negro 2: 206, t. 4, (1881). — Type collected between Pampa de Tilqui and Pampa de Trili, Neuquen, *Niederlein*.

Phaca inflata Gillies ex Hooker & Arnott, Bot. Misc. 3: 183 (1832). — Type from between Mendoza and Uspallata on the road to Canota, *Gillies*.

Astragalus inflatus Gillies ex Steudel, Nom. ed. 2, 1: 161 (1840). Not DeCandolle (1802).

Phaca striata Clos in Gay, Fl. Chile 2: 93 (1846). — Type from Andes de la Dehesa, prov. Santiago, Nov. 1829, *Gay 926*.

Astragalus striatus (Clos) Reiche, Anal. Univ. Chile 97: 570 (1897), and Fl. Chile 2: 113 (1898). Not Nuttall (1840).

Phaca macrocarpa Philippi, Linnaea 28: 619 (1857). — Type from the Cordillera de San Fernando, Feb. 1843, *Bustillos*.

Astragalus macrocarpus (Phil.) Reiche, Anal. Univ. Chile 97: 563 (1897), and Fl. Chile 2: 106 (1898). Not Pallas (1776), nor DeCandolle (1802).

Tragacantha bisinflata Kuntze, Rev. Gen. 2: 940 (1891). — Based upon *P. inflata* Gillies.

Tragacantha grandis Kuntze, Rev. Gen. 2: 941 (1891). — Based upon *P. macrocarpa* Phil.

Astragalus grandis (Kuntze) Spegazzini, Rev. Argent. Bot. 1: 214 (1926).

Astragalus megalocarpus Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 265 (1902). — Based upon *A. macrocarpus* Reiche, not Pallas.

Astragalus macrocarpus var. *petiolatus* Hauman, Anal. Soc. Cien. Argentina 86: 280 (1918–19). — Type from Puente del Inca, *Sanzin 349*.

RANGE: Chilean cordilleras from southern Coquimbo to Talca; Argentine cordilleras from southernmost San Juan south to northern Neuquen and eastward on the desert lowlands into central La Pampa and northern Rio Negro.

CHILE. Coquimbo: Cuncumén, Rio Choapa, *ex Philippi* (BD). Santiago: Andes de la Dehesa, Nov. 1829, *Gay 926* (type of *P. striata*, Paris); Las Condes, *herb. Reed* (G, K). Colchagua: Baños del Flaco, 1937, *Espinosa* (G); Val Tinguiririca, 1600 m. alt., 1897, *Wilczek 87* (Boiss). Talca: Cuesta Vergara, ca. 2300 m. alt., Jan. 1933, *Grandjot* (Grandjot); above Los Queñes, 1240 m. alt., 1936, *Mexia 7859* (G); Cord. de Curico, 1800 m. alt., Jan. 1897, *Reiche* (BD).

ARGENTINA. San Juan: Valle de la Rio Penitentes, Caleta Bicrak, March 1883, *Güssfeldt* (BD). Mendoza: Valle de Canota, *Gillies* (K); between Uspallata and Paramillo de Canota, gravelly soil in valley, *Gillies* (K); valleys between Mendoza and Uspallata by road of Canota, *Gillies* (type of *P. inflata*, K); La Loma del Agua de los Cielos, *Gillies 269* (G, K); Cajon de las Aguas, upper Rio Salado, Jan. 27, 1893, *Kurtz 7618* (NY); Los Molles, upper Rio Salado, Jan. 5, 1893, *Kurtz 7487* (NY); near La Quebrada, Dec. 1933, *Ruiz Leal 1836* (G); Paso de la Cruz de Piedra, 1500 m. alt., *Kuntze* (NY, US, BD); Malargue, *Monticelli E 71* (G). La Pampa: Puelén, *Durando* (G); Gob. de la Pampa, 1932, *un cura* (*Burkart*). Neuquen: between the pampas of Tilqui and Trili, rare in gypsum-soil, ca. lat. 37°, long. 70°, June 26, 1879, *Niederlein* (type of *A. pehuenches*, BD). Rio Negro: Choele-choel, Dec. 1907, *herb. Spegazzini* (Speg); campo between Rio Colorado and Rio Negro, Jan. 1903, *herb. Spegazzini* (Speg). Indefinite: Patagonia, lat. 50°–53°, *Moreno & Tonini 438* (NY).

A coarse spreading herbaceous plant with glabrous fruits and ovary. In its large spreading or pendulous papery pods it suggests *A. Darumbium*, but that plant has smaller flowers, a strigose ovary and fruit and a more erect habit of growth.

12. Astragalus valerianensis Johnston, Contr. Gray Herb. 85: 100 (1929). — Type from Rio Valeriana near La Cueva, 1926, *Johnston 6033*.

RANGE: Cordilleras of southeastern Atacama.

CHILE. Atacama: Rio Valeriano near La Cueva, cordillera east of Vallenar, 2800 m. alt., loamy talus slope, *Johnston 6033* (type, G).

A plant somewhat suggesting the montane forms of *A. Darumbium* but quickly distinguished by its glabrous ovary and fruit, strict stems, pedicels 4–6 mm. long, and detached more northerly occurrence. It is probably most closely related to *A. pehuenches*, but differs from that plant in its evidently strigose herbage, more slender and strict stems, and larger pods.

13. **Astragalus vagus** (Clos) Reiche, Anal. Univ. Chile 97: 563 (1897), and Fl. Chile 2: 106 (1898).

Phaca vaga Clos in Gay, Fl. Chile 2: 99 (1846). — Type from Pasto Blanco, cordilleras east of Coquimbo, *Gay 364*.

Astragalus Echegarayi Hieronymus, Bol. Acad. Nac. Cordoba 4: 22 (1881). — Type from Paramillo, west of San Juan, *Echegaray*.

Astragalus striatus var. *Echegarayi* (Hieron.) Hosseus, Bol. Acad. Nac. Cordoba 26: 156 (1922).

Phaca San Romani Philippi, Anal. Univ. Chile 84: 18 (1893). — Type from Queb. Seca, cordillera de Atacama, lat. 27° 55′, long. 69° 10′, *San Roman*.

Astragalus San Romani (Phil.) Reiche, Anal. Univ. Chile 97: 559 (1897), and Fl. Chile 2: 102 (1898).

RANGE: Higher cordilleras in the provinces of Atacama, Coquimbo and San Juan.

CHILE. Atacama: Cerro Cadillal, Cord. Rio Turbido, 3200 m. alt., *Werdermann 962* (G, K, BD); higher parts of Queb. de San Miguel, about alkaline flats and along dry stream-ways, 2800 m. alt., *Johnston 4922* (G, US, K); Rio Laguna Grande, 3800 m. alt., *Werdermann 244* (G, K, BD); Laguna Grande, in gravel, fl. pinkish, somewhat purplish at base, 3250 m. alt., *Johnston 5918* (G); Laguna Chica, in gravel, fl. white to flesh-colored, 3200 m. alt., *Johnston 5971* (G); Rio Sancarron below Rucas, gravelly bench, fl. pink to magenta, 3200 m. alt., *Johnston 6205* (G, K). Coquimbo: Pasto Blanco, Cord. de Elqui, 2837 m. alt., *Gay 364* (type of *P. vega*, Paris; G, K, BD, Del).

ARGENTINA. San Juan: Paramillo, Jan. 1876, *Echegaray* (type of *A. Echegarayi*, BD).

This appears to be the most common *Astragalus* with inflated pods found in the cordilleras of Atacama and Coquimbo. It may be related to *A. coquimbensis*, which occurs at low altitudes west of the cordilleras, but differs from that annual in its strong perennial root and somewhat smaller capitately congested pods. When I examined the type of *A. Echegarayi* I identified it with *A. vagus*, but subsequently as my studies of the genus progressed I have come to wonder if it might not really be a form of *A. monticola*. *Phaca San Romani*, however, is unquestionably a synonym of the present species.

14. **Astragalus Darumbium** (Bertero) Clos in Gay, Fl. Chile 2: 112 (1846).

Sutherlandia Darumbium Bertero ex Colla, Mem. Accad. Torino 37: 55 (1834). — Type from near Rancagua, *Bertero*.

Phaca macrophysa Philippi, Linnaea 28: 620 (1857). — Type from Las Arañas mine, Cord. de Santiago, Oct. 1853, *Philippi*.

Astragalus macrophysus (Phil.) Reiche, Anal. Univ. Chile 97: 554 (1897), and Fl. Chile 2: 106 (1898). Not Somm. & Levier (1893–94).

Phaca robusta Philippi, Anal. Univ. Chile 41: 690 (1872). — Type from the Cord. de Santiago.

Astragalus macrophysus var. *robustus* (Phil.) Reiche, Anal. Univ. Chile 97: 554 (1897), and Fl. Chile 2: 106 (1898).

Tragacantha firma Kuntze, Rev. Gen. 2: 941 (1891). — Based on *P. robusta* Phil.

Astragalus atuelii Chodat & Wilczek, Bull. Herb. Boiss. ser. 2, 2: 477 (1902). — Type from Arroyo Manga, Valle del Atuel, 1897, *Wilczek 86*.

RANGE: Cordilleras of Santiago and Colchagua and adjacent Mendoza.

CHILE. Santiago: Cerro Provencia, 2100–2500 m. alt., 1932–33, *Grandjot* (Grandjot); Valle de Ramon, 2200 m. alt., Feb. 1933, *Grandjot* (Grandjot); Valle de la Hierba Loca, 2300 m. alt., 1932, *Grandjot* (Grandjot); Manquehue, Oct. 11, 1908, *Rudolpho* (G); Las Arañas, Cord. de Santiago, Oct. 1853, *Philippi* (isotype of *P. macrophysa,* G); Cord. de Santiago, *ex Philippi* as *P. macrophysa* (BD). Colchagua: Baños de Cauquenes, Dec. 1901, *Elwes* (K); in sand along the Rio Cachapoal near San Joaquin, perhaps from seeds washed down from the cordilleras, 1829, *Bertero 679* (isotype of *S. Darumbium*, Paris, Del, BD, BM); Rancagua, Dec. 1828, *Bertero 679* (Del).

ARGENTINA. Mendoza: Arroyo Manga, Valle del Atuel, in sand and about rocks, 1900 m. alt., 1897, *Wilczek 86* (type of *A. atuelii*, Boiss).

The type of *A. Darumbium* is a very rank plant with coarse decumbent stems becoming 1 m. long and 7 mm. thick. It was discovered along a stream at the base of the cordilleras and thought to be a possible waif washed down from higher altitudes in the mountains ("fortasse semina ex cordilliera provenant"). Similar very coarse plants have not been rediscovered. A very closely related plant, however, has been found in the cordilleras and described as *P. macrophysa*, *P. robusta* and *A. atuelii*. This latter has shorter more slender stems, smaller leaves, perhaps shorter pedicels and larger black-hairy pods. The most reduced form is *P. macrophysa*. Apparently intermediate between this and the type of *A. Darumbium* is *P. robusta*. The indument on all these forms varies from sparsely to very densely strigose, some plants appearing glabrous at first sight while others are obviously silky with abundant appressed hairs.

When *A. atuelii* was originally described the type was given as from 900 m. altitude and as representing Wilczek's collection no. 372. The label on the type at Geneva, however, gives the altitude as 1900 m. and the collection number as 86.

The species is related to *A. monticola* and, in fact, grows with it in the cordilleras east of Santiago. It is distinguished from this relative by its usually larger fruit, slightly more elongate calyx, and silky appressed indument. Some of the montane forms have a root that is much more slender than in other cordilleran species of this general relationship, and in gross habit frequently suggest forms of *A. coquimbensis* and *A. paposanus*. The two latter species, however, are not closely related to our plant and are readily distinguished by having pink rather than violet or purple corollas.

15. **Astragalus monticola** Philippi, Linnaea 33: 47 (1864); Reiche, Anal. Univ. Chile 97: 549 (1897), and Fl. Chile 2: 92 (1898). — Type collected near the silver mines of Las Arañas, Cord. de Santiago, *Philippi*.

Astragalus ? Barceloi Philippi, Anal. Univ. Chile 84: 27 (1893); Reiche, Anal. Univ. Chile 97: 566 (1897), and Fl. Chile 2: 109 (1898). — "Ex Andibus chillanensibus, ni fallor, provenit."

RANGE: Cordilleras of Santiago and San Juan.

CHILE. Santiago: Las Arañas, Nov. 1861, *Philippi* (type of *A. monticola*, Santiago); Mina Disputada, Cord. de los Condes, 3500 m. alt., *Father Deny Le Manchee 258* (G); Mina Disputada, 2500–2600 m. alt., April 1933, *Grandjot* (Grandjot); Valle de la Hierba Loca, 2000–2300 m. alt., Nov. 1932, *Grandjot* (Grandjot); Valle Largo de las Condes, 2600 m. alt., Jan. 1934, *Grandjot* (Grandjot); Cerro Provencia, 2100 m. alt., Nov. 1933, *Grandjot* (Grandjot); Potrero Grande, 2160 m alt. Dec. 1933, *Behn* (G).

ARGENTINA. San Juan: between Tudeum and Queb. de Conconta, Jan. 1, 1930, *Perez Moreau 30/105* (G).

A species evidently related to the montane form of *A. Darumbium* and differing from it chiefly in having dull spreading, rather than silky closely appressed hairs on the leaves, stems and fruit. Though *A. monticola* and *A. Darumbium* sometimes grow together (Dr. Grandjot collected them both at Valle de Hierba Loca and at Cerro Provencia) they maintain their characters and are readily separable. The type of *A. Barceloi*, as Philippi suspected, is almost certainly mislabeled. The label on the type at Santiago reads "*Astragalus Barceloi*, Cord. de Chillan?," but the specimen agrees closely with the material I have cited from the cordilleras east of Santiago and I believe probably originated there.

16. **Astragalus vesiculosus** Clos in Gay, Fl. Chile, t. 17 (1844), and Fl. Chile 2: 120 (1846); Weddell, Chlor. Andina 2: 261 (1861); Reiche, Anal. Univ. Chile 97: 559 (1897), and Fl. Chile 2: 102 (1898). — Type from Cord. de los Patos, *Gay 488*.

Phaca nubigena Meyen ex Vogel, Verhandl. K. Leop.-Carol. Akad. Naturf. 19: suppl. pg. 16 (1843). — Type from 2400 m. alt. in the Cord. de San Fernando, *Meyen*.

Astragalus nubigenus (Meyen) Taubert in Engler & Prantl, Nat. Pflanzenf. iii. Abt. 3: 303 (1894); Reiche, Anal. Univ. Chile 97: 560 (1897), and Fl. Chile 2: 103 (1898). Not Don (1825).

Phaca Bustillosi Philippi, Linnaea 28: 680 (1857). — Type from the Cord. de San Fernando, *Bustillos*.

Tragacantha andina Kuntze, Rev. Gen. 2: 940 (1891). — Based upon *P. Bustillosi* Phil.

Astragalus nubigenus var. *Arnottianus* Meyen ex Reiche, Anal. Univ. Chile 97: 561 (1897), and Fl. Chile 2: 104 (1898). — Based upon "*Phaca Arnothiana* Hook." sensu Meyen, Reise 1: 356 (1834); i.e., Rio Maipo, 11000 ft. alt., *Meyen*.

Astragalus rupestris Reiche, Anal. Univ. Chile 97: 562 (1897), and Fl. Chile 2: 105 (1898). — Based upon *Phaca Bustillosi* Phil.; not *Astragalus Bustillosii* Clos.

Astragalus Meyenianus Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 262 (1902). Based upon *Astragalus nubigenus* Taubert; not *A. nubigenus* Don.

Astragalus Ameghinoi Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 262 (1902). Type from between San Julian and Rio Deseado, Santa Cruz, *Ameghino*.

Astragalus Meyenianus var. *paucifoliolata* Hicken, Darwiniana 1: 56 (1923). — Type from Cajon del Burro, Rio Atuel, *Gerth 102* and *106a*.

RANGE: From the provinces of San Juan and Coquimbo southward along the higher Andes to Mendoza and Talca, and with outlying stations in Chubut and Santa Cruz.

CHILE. Coquimbo: crest of the high cordilleras of Los Patos, 3340 m. alt., *Gay 488* (Paris, type of *A. vesiculosus*); Cerro la Yerba Loca, east of La Vega Escondido, dept. Illapel, 2800–3450 m. alt., fl. blue and white, Dec. 1938, *Morrison 16932* (G). Aconcagua: near Junta de Pinquenes, Rio Sobrante, dept. Petorca, rocky slopes, 3500–3700 m. alt., fl. blue-purple, *Morrison 17284* (G). Santiago: Cord. de Santiago, 3500 m. alt., Feb. 1899, *Reiche* as *A. Bustillosii* (BD); Cord. de Santiago, 1899, *ex Philippi* as *A. rupestris* (BM); Cajon del Cepo, Cord. Santiago, 2900 m. alt., Feb. 22, 1894, *Dessauer* (Munich); above Laguna Negra, 3300 m. alt., 1902, *Hastings 498* (US); Rio Maipo [upper Rio del Volcan!] 3300 m. alt., Feb. 1831, *Meyen* as *P. Arnottiana* (BD, type of *A. nubig.* var. *Arnottianus* Reiche); Paso de Maipo, Jan. 1883, *Güssfeldt* (BD); Paso de la Cruz Piedra, 2300 m. alt., Jan. 1892, *Kuntze* (NY, BD, US). Colchagua: Cord. Tinguiririca, east of Rengo, 2200 m. alt., 1930, *Pirion 702* (G); El Teniente, Rio Coya, 2800 m. alt., 1925, *Pennell 12317* (G); Cord. de San Fernando, Feb. 1843, *herb. Philippi* as *P. Bustillosii* (? type of *P. Bustillosi*, Santiago); Cord. de San Fernando, *Meyen* (BD, type of *P. nubigena*); Cord. del Rio Tinguiririca, 2400 m. alt., Feb. 1831, *Meyen* as *P. nubigena* (BD). Talca: near Volcan Peteroa, *Bridges 1129* (K); Santa Elena, Cord. de Curico, Feb. 1902, *Flaminio Ruiz* (G).

ARGENTINA. San Juan: crest east of Carrisito (Rio Blanco), ca. 3200 m. alt., Nov. 17, 1915, *Hosseus 1448* (BD). Mendoza: Punta de Vacas, March 1901, *Spegazzini* (Speg); "La Cumbre, Las Cuevas," Dec. 1908, *Spegazzini* (Speg); Paso del Portillo, 3500–4000 m. alt., *Ruiz Leal 1985* and *2110* (G); Paso Hondo, Valle Rio Tunuyan, *Ruiz Leal 2064* (G); Rio Tordillo, Piedra del Burrero, ca. 2900 m. alt., 1897, *Wilczek 105* (Boiss, US); Cajon del Burro, ca. 2900 m. alt., *Wilczek 104* (Boiss, US); Cerro de los Guanacos, 2600 m. alt., Jan. 1921, *Carette 227* (G); Mala Dormida, 2700 m. alt., Jan. 1921, *Carette 238* (LP). Chubut: Valle de Laguna Blanca, *Koslowsky 177* (K). Santa Cruz: between San Julian and Rio Deseado, 1899, *Ameghino* (Speg, type of *A. Ameghinoi*).

This species is best known from the cordilleras about the headwaters of the Rio Maipo. Though apparently with a rather disrupted distribution it is a very distinct and readily recognizable species, characterized by its grayish loose indument, broad crowded obcordate leaflets, small frequently pale corollas and firm rounded inflated hairy pods.

Among the synonyms cited above, only *A. Ameghinoi* deserves special mention. The type of this species comes from southern Patagonia, far to the south of the principal range of *A. vesiculosus*. In appearance and all vegetative and habit characters it is similar to *A. vesiculosus*. The fruit, however, is small (ca. 1 cm. long), rigid, and very densely and conspicuously hairy. It is, however, not thoroughly ripened, and I suspect that some or all of these differences may be associated with immaturity. Concerning *A. Ameghinoi* it may be noted that of the two collections cited by Spegazzini the one from the Golfo de San Gorge is a very immature specimen of *A. Dusenii* showing flower-buds only.

17. **Astragalus Arnottianus** (Gillies) Reiche, Anal. Univ. Chile 97: 561 (1897), and Fl. Chile 2: 104 (1898).

Phaca Arnottiana Gillies ex Hooker & Arnott, Bot. Misc. 3: 184 (1832). — Type material from El Cerro de la Polcura and Las Leñas, Mendoza, *Gillies*.

Phaca uspallatensis Philippi, Anal. Univ. Chile 36: 168 (1870). — Type collected between Mendoza and Uspallata.

Phaca Reedi Philippi, Anal. Univ. Chile 36: 168 (1870). — Type from the eastern side of Paso del Portillo, Mendoza, *Reed*.

Astragalus Reedii (Phil.) Hauman, [Veg. Hautes Cord. 127] Anal. Soc. Cien. Argentina 86: 281 (1918).

Phaca nana Philippi, Anal. Univ. Chile 84: 19 (1893). — Type from Cordillera del Peuco, prov. Colchagua.

Astragalus nanus (Phil.) Reiche, Anal. Univ. Chile 97: 569 (1897), and Fl. Chile 2: 112 (1898). Not DC (1802).

Astragalus Philippi Spegazzini, Anal. Mus. Nac. Buenos Aires iv. 4: 265 (1902). — Based on *P. nana* Phil.

RANGE: Along the higher cordilleras from Coquimbo and La Rioja southward to Mendoza and Colchagua.

CHILE. Coquimbo: between Guanta and Baños del Toro, *Reed* (K); Estero de Guanta, 3500 m. alt., *Johnston 6252* (G, US). Aconcagua: upper Rio Aconcagua, 3600 m. alt., *Gosse* (K); Caracoles, *Jaffuel 3508* (G); Juncal, 2300 m. alt., 1913, *Buchtien* (G, US, BM, BD). Santiago: Cajon de Esmeralda, 1900, *J. Philippi* (G); Valle del Yeso, *Reed* (K); Laguna Negra, Feb. 1901, *Ayarzum* (BM). Colchagua: El Teniente, Rio Coya, 2800 m. alt., *Pennell 12337* (G); Cord. del Peuco, 1886, *herb. Philippi* (type of *P. nana*, Santiago).

ARGENTINA. La Rioja: Queb. Descubrimento Nuevo, *Hosseus 1398* (BD). Mendoza: Cord. del Tigre, 2500 m. alt., *King 323* (BM); Cumbre de Uspallata, 3600 m. alt., *Wilczek 103* (Boiss); Puente del Inca, *King 12* (K); Las Cuevas, *Hosseus 2152, 2168* and *2230* (BD); Paramillo de las Cuevas, 3800 m. alt., *Bettfreund 261* (BD); Punta de Vacas, *King 690* (BM); Queb. Benjamin Matienzo, Las Cuevas, *Perez Moreau 12632* (G); Las Leñas, *Gillies* (K); Las Leñas and El Cerro de la Polcura, *Gillies* (type of *P. Arnottiana*, K); Queb. de las Cauteras, Las Heras, 1200–1600 m. alt., *Semper 4222* (G); Valle de las Relinchos, 3400–3600 m. alt., *Semper 4921* and *4922* (G); Tres Quebradas, Tupungato, 2840 m. alt., *Ruiz Leal 3613* (G); precord. near Rincon Colorado, Tunuyan, 2500–3000 m. alt., *Ruiz Leal 1307* (G); near Cuesta de los Atlijidos, Cord. del Portillo, *Ruiz Leal 1876* and *1876 A B* (G).

A well known and readily recognized species of the central cordilleras of Argentina and Chile. In its area it is the only species with mottled, glabrous, inflated pods. It appears to be common in the Andes of Mendoza below Uspallata Pass. From this area came the type of *A. Arnottianus*. Also from this region came the plants discussed and well illustrated (as *A. oreophilus*) by Hauman, [Veg. Hautes Cord. 126] Anal. Soc. Cien. Argentina 86: 280, t. 24, f. 4–5 (1918).

The species is evidently related to *A. palenae* which occurs along the cordilleras further to the south. From this relative *A. Arnottianus* is distinguished by having the leaflets more or less evidently strigose on the upper surface and the wings of the corolla always conspicuously longer than the keel. The fruit is always glabrous. At high altitudes the species becomes reduced in size and very compact in habit. One of these dwarfed extremes appears to be that described by Philippi as *Phaca Reedi*.

18. **Astragalus palenae** (Phil.) Reiche, Anal. Univ. Chile 97: 542 (May 1897), and Fl. Chile 2: 85 (1898); Spegazzini, Rev. Fac. Agron. y Vet. La Plata 3: 600 (Sept. 1897).

? *Phaca oreophila* Philippi, Linnaea 28: 681 (1857). — Type collected by Germain in the cordilleras east of Linares, prov. Maule.

? *Astragalus oreophilus* (Phil.) Reiche, Anal. Univ. Chile 97: 561 (1897), and Fl. Chile 2: 104 (1898).

Phaca palenae Philippi, Anal. Univ. Chile 84: 23 (1893). — Type from the Valley of the Rio Palena, ca. lat. 44° S., *F. Delfin*.

Phaca Rahmeri Philippi, Anal. Univ. Chile 84: 23 (1893). — Type from Laguna de Gualletué, prov. Gautin, 1887, *Rahmer*.

Astragalus Rahmeri (Phil.) Reiche, Anal. Univ. Chile 97: 542 (1897), and Fl. Chile 2: 85 (1898).

Astragalus pallens Reiche ex K. Schum. in Just, Bot. Jahresber. 26[1]: 352 (1900), lapsu calami.

Astragalus palenae var. *grandiflora* Spegazzini, Anal. Mus. Nac. Buenos Aires, ser. 2, 4: 267 (1902). — Type collected by Spegazzini near Lago Nahuel-huapi.

RANGE: Along the cordilleras from Neuquen and Cautin (and possibly Maule) southward to the drainage of the Rio Palena and Chubut.

CHILE. ?Maule: cord. Maule, *Germain* as *A. vesiculosus* (K, BM, Del). Cautin: "Araucania" [?Laguna de Gualletué, upper Bio Bio] *ex Philippi* as *P. Rahmeri* (K, BD).

ARGENTINA. Neuquen: San Martin de los Andes, 720 m. alt., *Comber 791* (K); Zapala district, *Opozo sub Comber 1160* (K); Pino Hachado, 2000 m. alt., 1920, *Parodi 2038* in pt. (Parodi). Rio Negro: Puerto Americano near Bariloche, 1928, *Rafael Cordini 194* (US); Bariloche, 1934, *Burkart 6277* (G); Sierra Gutierrez, Bariloche, 1400 m. alt., 1905, *Buchtien 21* (US); near Lago Nahuel-huapi, Dec. 1897, *Spegazzini* (Speg, type of var. *grandiflora*). Chubut: near Carren-leofu, 1901, *Illin* (Speg); near Carren-leofu, 1889, *Moyano* (Speg); Pampa Chica, Nov. 12, 1908, *Skottsberg 567* (Stock); Chubut, Dec. 1897, *collector?* (Speg); Patagonia, *Moreno & Tonini 439* as *Trag. Cruckshanksii* (NY).

18a. **Astragalus palenae** var. **Duseni** (Macloskie), comb. nov.

Astragalus brevicaulis Dusen, Sven. Exped. Magell. 3: no. 5, pg. 158 (1900). — Type from Cabo Domingo, eastern Fuegia, *Dusen*.

Astragalus Duseni Macloskie, Fl. Patagonia 2: 962 (1906). — Based upon *A. brevicaulis* Dusen (1900), not Nelson (1899).

RANGE: Eastern Fuegia northward to southwestern Chubut.

ARGENTINA. Santa Cruz: Killik Aike, Rio Gallegos, 1900, *Brown 21* and *54* (NY); Cape Fairweather, mouth of Rio Gallegos, *Capt. King* (K, BM); Rio Coyle, Estab. Las Vegas, 1916, *Dauber 130* (Parodi); Puerto Santa Cruz, Dec. 1904, *Dusen 5481* (Stock); Rio Santa Cruz, 1882, *Spegazzini* (Speg); Lago Argentino, *Furlong 81* (G, NY, K); Burmeister Peninsula, Lago Argentino, *Prichard* (BM); Lago San Martin, *1903, collector ?* (Speg); San Julian, 1833, *Henslow 80* (K); San Julian, 1904, *Dusen* (Stock); San Julian, 1931, *Blake 2, 172* and *180* (K); Golfo de San Jorge, Feb. 1896, *Ameghino* (Speg, as *A. Ameghinoi*). Chubut: Rio Aysen, Dec. 1900, *collector ?* (Speg); Lago Blanco, Dec. 1903, *collector ?* (Speg); Chubut, Jan. 1898, *collector ?* (Speg).

Among the species with inflated fruit the present species is characterized by its austral distribution, its folded leaflets that are glabrous above, and its corolla-wings which are shorter than the keel or barely surpass it. Typical *A. palenae* comes from the valley of the Rio Palena (or the Rio Carrèn-leofu as it is called within Argentine). This form has the wings of the corolla evidently surpassed by the keel. The corolla is about 11 mm. long. Further north, about Lake Nahuel-huapi and the headwaters of the Rio Bio Bio, a coarser form is common. This has larger leaflets and coarser (13–16 mm. long) corollas and is represented by the type of the var. *grandiflora* Speg. I have accepted this variety as a luxuriant form of the species. Typical *A. palenae* is known from the same general region in which the variety has been found.

Beginning in southwestern Chubut and extending to Fuegia there are plants that agree well with typical *A. palenae* except that the wings and keel are subequal. These plants represent the variety *Duseni*. In the collection cited from Lago Blanco half of the plants in it have corollas of typical *A. palenae* and the other half those of the var. *Duseni*. They are

otherwise indistinguishable. The ovary and fruit of *A. palenae* and its var. *Duseni* are usually glabrous. As exceptions to this general rule, however, there is to be noted a collection from San Julian (*Blake 180*) in which some of the plants have glabrous and the others have densely strigose ovaries. A collection (Chubut, Jan. 1898) in the Spegazzini Herbarium has the ovaries and also mature fruit conspicuously strigose.

I have seen no authentic material of *Phaca oreophila* but I suspect that it may represent what is here treated as *A. palenae*. The descriptions of *A. oreophilus* given by Philippi and by Reiche seem to apply equally well to both *A. Arnottianus* and *A. palenae*. The type of *A. oreophilus* unfortunately lacks corollas. It came from the cordilleras above Linares in what is now the province of Maule. Should *A. oreophilus* prove actually conspecific with *A. palenae* then the former name, being older, must be taken up as the correct appellation for the concept here treated.

It is possible that the species may have another old name in *Phaca quindecimjuga* Phil. (1862), which was based on collections said to be from the cordilleras of Coquimbo though perhaps actually from the mountains of southern Chile. Further details regarding *P. quindecimjuga* will be found in the discussion of unplaced species.

19. **Astragalus argentinus** Manganaro, Anal. Soc. Cien. Argentina 87: 145, fig. 14 (1919). — Original collections from Sierra del Tandil, Sierra Peregrina and Sierra de Curamalal.

RANGE: Known only from the mountains in the southern half of the province of Buenos Aires.

ARGENTINA. Buenos Aires: Sierra de la Ventana, Nov. 1904, *Dusen 6279* (Stock); Pueblo Tornquisto, Dec. 21, 1899, *collector not given* (Speg).

Though this very well marked local species was compared with *A. Bergii* by Manganaro, it certainly cannot be closely related to that plant. While showing evident differences in the proportions of its flowers, *A. argentinus* reveals its obvious relations with *A. Cruckshanksii* in its tough leathery fruit and salient pod-sutures.

20. **Astragalus Illinii,** nom. nov.

Astragalus Moyanoi var. *villosula* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 267 (1902). — Type from along the Rio Carren-leofu, 1900, *Illin*.

RANGE: Known only from Chubut.

ARGENTINA. Chubut: Carren-leofu, 1900, *N. Illin* (Speg, type); Chubut, 1903, *collector ?* (Speg).

A species apparently most closely related to *A. Cruckshanksii* but differing conspicuously in its indument and fruit. The leaves, fruit, and younger parts of the plant are canescent with a subtomentose indument of very slender loosely appressed hairs 1–2 mm. long. The angularly subovate or subglobose fruit is evidently higher (dorso-ventrally) than long or thick. It usually measures 10 × 6 × 6 mm. The valves though highly convex are compressed at their very margin. This consequently elevates the keel which encircles the fruit. The fruit is one-celled and has no false septum. When mature it is tough, rigid and filled with seeds.

21. **Astragalus Cruckshanksii** (H. & A.) Grisebach, Abhand. K. Ges. Wiss. Goettingen 24: 103 (1879), as *"A. Cruikschankii";* Reiche, Anal. Univ. Chile 97: 558 (1897), and Fl. Chile 2: 101 (1898).

Phaca Cruckshanksii Hooker & Arnott, Bot. Misc. 3: 184 (1832); Philippi, Linnaea 33: 41 (1864). — Type collected by Cruckshank between Tambillos and Puente de Inca, cordillera of Mendoza, not in the "cordilleras of Chile" as originally given!

Phaca Landbecki Philippi, Linnaea 33: 42 (1864). — "In Andibus prov. Colchaguae legit orn. Landbeck."

Astragalus Landbecki (Phil.) Reiche, Anal. Univ. Chile 97: 562 (1897), and Fl. Chile 2: 105 (1898).

RANGE: Cordilleras from Atacama and Mendoza south to Colchagua and Neuquen.

CHILE. Atacama: Queb. Alfalfa, dept. Vallenar, 3200 m. alt., *Johnston 5991* (G, K); Rio Valeriano at Juntas del Encierro, 3200 m. alt., *Johnston 6015* (G, US); Los Cuartitos, 3420, *Johnston 6228* (G). Coquimbo: Baños del Toro, 3500 m. alt., *Werdermann 202* (G, BM, BD); high cordilleras of Los Patos, 2537 m. alt., *Gay 487* (Paris); Las Hediondas, Baños del Toro, 1938, *Espinosa* (G). Aconcagua: El Peñon, *Poeppig 99/18* (BD, Paris); Juncal, 2100 m. alt., *Elliott 164* (K); Las Calaveras, 3100 m. alt., *Buchtien 1195* (G, US, BM, BD); cordilleras, *Cuming 319* (K, BM). Santiago: Cord. de la Dehesa, Nov. 1929, *Gay 533* (Paris); Valle Ramon, 2800 m. alt., Feb. 1933, *Grandjot* (Grandjot); Potrero Grande, 2200 m. alt., Dec. 1933, *Grandjot* (G); Valle Engorda, 2400 m. alt., March 1933, *Grandjot* (Grandjot); near San Gabriel, Maipo valley, 3000 m. alt., *Grandjot 3586* (G). Colchagua: Baños El Flaco, Cajon de Las Damas, Cord. San Fernando, 1800 m. alt., Dec. 1936, *Milner* (Behn); Cord. de Colchagua, 2000 m. alt., Jan. 1930, *Pirion 94* (G); Cord. de Colchagua, 3000–3600 m. alt., Dec. 1860, *Landbeck* (type of *P. Landbecki*, Santiago).

ARGENTINA. Mendoza: Cord. del Tigre, 2500 m. alt., *King 322* (K); between Tambillos and Puente del Inca, *Cruckshank 94* (type of *P. Cruckshanksii*, Kew) and *Perez Moreau 12628* (G); Puente del Inca, *Malme 2817* (US); Las Cuevas, *Perez Moreau 12633* (G); Cerro del Diamante and Cerro de la Polcura, *Gillies* (K); Cerro de los Aflijidos, *Ruiz Leal 1877* (G); Real de Contreras, Valle Tunuyan *Ruiz Leal 2120* (G); Valle Tunuyan, *Ruiz Leal 1925* (G); Los Guanacos, 2000 m. alt., *Carette 3000* (LP); Mala Dormida, 2700 m. alt., *Carette 240* (G); Cajon del Burro, Valle Atuel, 2900 m. alt., *Wilczek 115* (Boiss, US); Piedra del Burrero, 2900 m. alt., *Wilczek 118* (Boiss, US); Paso de la Cruz Piedra, 2500 m. alt., *Kuntze* as *T. Philippiana* (NY). Neuquen: Liu Cullin, 1350, *Comber 309* (K); Pino Hachado, *Parodi 2198* (Parodi); Vega Lolog, 810 m. alt., *Comber 824* (K).

As here defined the name *A. Cruckshanksii* is restricted to the well known and characteristic plant of middle altitudes in the central Andes of Chile and Argentina. It is closely related to *A. Amunategui* and, in the southern parts of its area, perhaps intergrades with that more southerly and easterly ranging species. It differs from its relative in its more distinctly montane habitats, its prevailingly prostrate stems, and its elliptic or oblanceolate obtuse or emarginate leaflets. The species was first collected and is best known along the road to Uspallata Pass in Mendoza. Plants from the area have been illustrated and discussed by Hauman, [Veg, Hautes Cord. 125] Anal. Soc. Cien. Argentina 86: 289. t. 21, f. 5 (1918). Chilean specimens and those from Mendoza are rather uniform in appearance and usually have evidently strigose leaflets and fruit. The specimens cited from Neuquen, however, have the ovary and fruit glabrous and two of the collections (Liu Cullin and Pino Hachado) have practically glabrous leaflets. These southern forms have the leaflets of *A. Cruck-*

shanksii and seem more closely related to that species than to *A. Amunategui*. I suspect that they may prove to represent a variation worthy of some taxonomic recognition. It will be noted that they come from an alitude distinctly lower than that affected by good *A. Cruckshanksii*.

The fruit of typical *A. Cruckshanksii* is very strongly compressed laterally, the elliptic leathery valves being almost flat and parallel. It is noteworthy, therefore, that in one of the collections from Neuquen (*Parodi 2198*), the valves are not flat but convex and the pod evidently inflated, being lenticular in cross-section and compressed only in a narrow rim about the margin of the valves. The fruit, in fact, is very similar to that found in some specimens (*Carette 242* and *243*) of *A. Amunategui*.

22. **Astragalus Amunategui** Philippi, Anal. Univ. Chile 84: 31 (1893). — Type from Las Choicas.

Astragalus Amunateguianus Philippi ex Reiche, Anal. Univ. Chile 97: 560 (1897), and Fl. Chile 2: 103 (1898). — A variant spelling.

Tragacantha Cruckshanksii var. *glabrescens* Kuntze, Rev. Gen. 3: 73 (1898). — Type from Chilean side of the Paso de la Cruz Piedra, 2500 m. alt., *Kuntze*.

Astragalus Moyanoi Spegazzini, Rev. Fac. Agron. y Vet. La Plata 3: 601 (1897). — Type from Teka-choique, western Chubut, ca. lat. 43° 30′, *Moyano*.

RANGE: Southern Mendoza and adjoining Santiago south into Patagonia.

CHILE. Santiago: Paso de la Cruz Piedra, 2500 m. alt., *Kuntze* (type of var. *glabrescens*, NY; isotypes US, BD). Colchagua: "Cord. de San Fernando," *ex Philippi* as *A. Amunateguianus* (US, K, BD).

ARGENTINA. Mendoza: Las Choicas, Jan. 1872, *ex Philippi* as *A. Amunateguianus* (Speg); Cuesta de los Aflijidos, *Ruiz Leal 1877* (G); Cerro de Guanacos, 2600 m. alt., *Carette 242* and *243* (LP); Cerro Nevado, dept. S. Rafael, *Carette 2552* (G). Neuquen: Mangrullo, 900 m. alt., *Ammann 76* (FM); Laguna Llancanelo, Nov. 1902, *herb. Spegazzini 2145* (Speg). Chubut: Rio Teka-choique, 1889, *Moyano* (type of *A. Moyanoi*, Speg); Comodoro Rivadavia, *Renard 13804* (G), *Ferruglio 30/1859* (G), and *Parodi 289* (Parodi); Puerto Madryn, *Dusen 5374* (Stock).

The plants here assembled under *A. Amunategui* come from an area lying between the ranges of *A. patagonicus* and *A. Cruckshanksii* and perhaps intergrade with both species. Their closest relationship seems to be with *A. patagonicus*. Indeed they may prove to be simply a luxuriant northern form of that southern species.

Typical *A. Amunategui* is a plant having the gross habit of *A. Cruckshanksii* but differing in its lanceolate leaflets and somewhat inflated strigose pods. The flowers and fruit are bunched in a subumbellate cluster on peduncles that are distinctly recurved at maturity. Specimens very similar to the type have been collected at Cerro Guanacos and Cerro Nevado, Mendoza, by Carette. The other collections referred to the species differ from those distributed by Philippi and Carette in being more erect plants with elongate loosely flowered racemes on erect peduncles. Included among them are the types of *A. Moyanoi* and *T. Cruckshanksii* var. *glabrescens*. These types are rather similar in general appearance, but differ in some details. The type of *A. Moyanoi* has the ovary and the leaflets glabrous whereas these are strigose and the leaflets less definitely acute in the var. *glabrescens*. The collections from Comodoro Rivadavia and Puerto Madryn much resemble one another and are very slender plants

with very few erect stems and very slender possibly annual roots. The racemes are loosely flowered and elongate and borne on erect peduncles. This particular form is very similar to some of the luxuriant forms of *A. patagonicus*.

When Philippi published *A. Amunategui* he stated that it was named in memory of Michal L. Amunatégus and gave its source as "Habitat in Andium loco Las Choicas dicto." I have seen a number of collections, scattered in various herbaria, distributed by Philippi as "*A. Amunategui-anus* Phil." These are mostly labeled as from the "Cordillera de San Fernando," but one is given as from "Las Choicas, Jan. 1872." All these specimens are extremely similar in details of size, maturity, discoloration etc., and I believe them to be parts of one collection. They agree closely with the original description and almost certainly are duplicates of the type. Their source is probably a short distance east of the Chile-Argentina boundary in Mendoza. There is a well known route from San Fernando, Colchagua, up the Rio Tinguiririca to the Paso de las Damas on the continental divide. Descending eastward from the pass the road crosses Arroyo de Las Choicas and passes close to the Mina de Las Choicas. The type of the *Astragalus* was probably obtained in this vicinity. In Jan. 1872 Paul Ortega traveled this route to Valle Hermosa (about 25 km. south of Choicas) and collected the types of *Gayophytum robustum* Phil., *Verbena ulicina* Phil., *Boopsis breviscapa* Phil., *Carex vallis-pulchrae* Phil., etc., and very likely the original material of our plant also.

As now known the species is practically confined to Argentina. The only Chilean material seen is the collection by Kuntze, the type of the var. *glabrescens*, labeled "Chile, Paso Cruz, 2500 m., Jan. 1892." If the data on the label are trustworthy the plant came from 1000 m. below the summit of Paso de la Cruz Piedra in the headwaters of the Rio Maipo, in the province of Santiago. Interestingly, among all the specimens referred to *A. Amunategui*, this Chilean one has characters most closely approaching those found in *A. Cruckshanksii*.

23. **Astragalus patagonicus** (Phil.) Spegazzini, Rev. Fac. Agron. y Vet. La Plata 3: 505 (1897).

Phaca patagonica Philippi, Anal. Univ. Chile 84: 20 (1893). — "In Patagonia haud procul a colonia chilensi Decembri 1878 legit orn. Henricus Ibar. . . "

RANGE: Southern Patagonia.

CHILE. Magallanes: Patagonia, *ex Philippi* as *P. patagonica* (isotype, K, Speg).

ARGENTINA. Santa Cruz: Killik Aike, Rio Gallegos, *Brown 27* (NY); Estab. Las Vegas, Rio Coyle, *Dauber 129* (G); upper Rio Santa Cruz, Lago Argentino, *Hauthal 8786* (Speg); near Lago Argentino, *Furlong 82* (G, NY); Rio Santa Cruz, 1882, *Spegazzini* (Speg); Puerto San Julian, *Dusen 6332* (K, Stock) and *Blake 2A* (K, BM); Caleta Olivia, *Donat 141* (G in pt.; K, NY); Cañadon de las Vacas, 1891, *Beaufils* (G); Patagonia, lat. 50°–53°, *Moreno & Tonini 188* and *206* (NY). Chubut: Valle de la Laguna Blanca, *Koslowsky 178* and *183* (K); Pampa Chica, *Skottsberg 539* (Stock); Lago Musters, 1899, *Illin* (Speg); Lago Colhue Huapi, 540 m. alt., *Riggs 44* (G, FM); Corcovado, 1901, *Illin* (Speg); along Rio Carren-leofu, 1900, *Illin* (Speg). Neuquen: Cord. del Viento, subito de Atrenco, *Rengonese 295* (G).

This species appears to be most common in Santa Cruz and southern Chubut. The plants are dwarfed with the leaf-bearing seasonal stems only a few centimeters long and with the internodes very much shortened or scarcely developed. A multicipital caudex is formed from which arise tufts of leaves and the scapose peduncles. The flowers are usually few and borne in umbellate clusters. The flattened pod may be strigose, but frequently is more or less glabrous. The leaflets are narrow, 1–3 mm. broad, and linear. Most of the collections cited are readily placed and obviously referable to *A. patagonicus*. A few specimens from Santa Cruz (*Furlong 82; Dusen 6332*) and Chubut (Lago Musters and Carren-leofu, *Illin*) are more vigorous plants with more elongate stems than the other specimens cited and make embarrassing approaches to the various forms of *A. Amunategui*.

24. **Astragalus Burkartii**, sp. nov.

Herba caespitosa; ramulis caudicis prostratis congeste breviterque ramosis 3–5 mm. crassis, stipulis laxe ochraceis 3–5 mm. longis glabris vel breviter ciliatis marcescentibus chartaceis pallidis dense vestitis; foliis apice caudicis stipulosi congestis; rhachibus 10–30 (–40) mm. longis; foliolis ellipticis (2–) 3–6-jugatis 2–5 mm. longis 1–3 mm. latis viridibus crassiusculis costatis sed enervatis supra glabris subtus sparsissime adpresseque villosis apice rotundis vel retusis; floribus 2–4 in racemos brevissimos 1–5 mm. longe pedunculatos dispositis; calycibus sparse adpresse villosis 8–10 mm. longis tubo 2–3 mm. crasso 1–2 mm. longe pedicellato dentibus gracilibus 2–5 mm. longis tubo brevioribus; corolla conspicua violacea vexillo 15 mm. longo, lamina late elliptica 8–10 mm. longa ca. 7 mm. lata, alis 3–4 mm. latis vexillo 2 mm. brevioribus carina 2–3 mm. superantibus; ovario glabro; leguminibus evidentibus ascendentibus biconvexis glabris unilocularibus basim versus crassioribus lateraliter compressis margine acutis prominentibus; valvulis 10–15 mm. longis 5–7 mm. latis medium versus vel paulo infra medium latioribus apice acutis recte apiculatis basi obtusis vel rotundis intus sparse pubescentibus; seminibus 10–15 nigrescentibus maculatis compressis ca. 2.5 mm. diametro.

ARGENTINA. Tucuman: Peñas Azules, Sierra Calchaquies, dept. Tafi, among dry rocks, fl. rather large, blue, 3400 m. alt., Jan. 1933, *Burkart 5403* (G). Catamarca: Cerro de la Tambilla, low and spreading, fl. pinkish blue, March 25, 1917, *Joergensen 1337* (Gray Herb., type); Sierra del Anconquija, dept. Santa Maria, rocky places, fl. bright violet, 4600 m. alt., March 1, 1925, *Venturi 6693* (US). Salta: Cerro de Cachi, dept. San Carlos, rocky places, fl. bright violet, 4500 m. alt., March 12, 1927, *Venturi 6692* (US); between Cuesta del Arca and Trancas, Jan. 1897, *Spegazzini 2100* and *2102* (Speg); Pampa Grande, Jan. 1897, *Spegazzini 2103* (Speg).

The nearest relative of *A. Burkartii* is probably *A. Venturii*, a poorly understood and perplexing species also occurring at high altitudes in northwestern Argentina. From that species it is readily separated by having flowers almost twice as large, usually more numerous leaflets, a sparser pale rather than yellowish indument, a more compacted caudex with less elongate stems, and looser pale rather than yellowish sheathing stipules. The fruit of *A. Burkartii* appears to be much larger and its sutures are both salient. They are laterally compressed and ovate-elliptic in outline. No traces of a false septum are present.

25. **Astragalus crypticus**, sp. nov.

Planta humilis caespitosa; caudice multicepitali denso e radice valida profunda oriente, ramulis stipulis ochreaceis imbricatis obtectis apice fasciculos foliorum dense argenteo-strigosorum proferentibus; stipulis marcescentibus stramineis vaginatis ca. 5 mm. longis dorse sparse villosis acutis vel apice emarginatis; rhachi folii 1–3.5 mm. longo basi inter stipulis occulto; foliolis lanceolatis vel ellipticis 3–4-jugatis 1–2.5 mm. latis 3–6 mm. longis apice acutis; floribus axillaribus solitariis subsessilibus; calycibus inter stipulis occultis 5–6 mm. longis, tubo strigoso 3–4 mm. longo, lobis angustis 2–3 mm. longis; corolla flavescente, vexillo ca. 6–7 mm. longo cum lamina 3.5–4 mm. lata, alis 5–6 mm. longis angustis quam carina 1.5 mm. longioribus; leguminibus inter stipulis occultis 3–4 mm. longis 1–1.7 mm. crassis 2–3 mm. altis dense appressi-villosis, margine vix intrusis, suturis prominentibus donatis, valvulis cartilagineis ellipticis vel oblique ovatis; seminibus saepe 2.

ARGENTINA. Tucuman: Cumbres Calchaquies, dept. Tafi, en la puna tucumana, 4400 m. alt., Jan. 30, 1933, *Burkart 5407* (type, Gray Herb.); La Puerta, Sierra Calchaquies, 4000 m. alt., Jan. 30, 1933, *Burkart 5405* (G); Sierra del Cajon, dept. Tafi, mountain slopes among rocks, fl. yellowish, 3500 m. alt., March 12, 1927, *Venturi 9435* (US).

A very distinct species with its closest relations in *A. cryptobotrys* of northwestern Argentina and adjacent Chile. The two species agree in fruit-structure. Their pods are more or less lenticular with both sutures salient. The valves are cartilaginous and abundantly covered with similar appressed silky hairs. There is no false septum developed. The two species differ, however, in size of fruit, habit of growth, and shape of leaflets. In gross habit our present plant much simulates that of *A. peruvianus* and its allies.

26. **Astragalus cryptobotrys**, nom. nov.

Phaca clandestina Philippi, Fl. Atac. 14 (1860). — Type from Valle Sandon, 2700 m. alt., *Philippi*.

Astragalus clandestinus (Phil.) Hieronymus, Bol. Acad. Nat. Cien. Cordoba 4: [Sert. Sanjuan.] 22 (1881); Reiche, Anal. Univ. Chile 97: 537 (1897), and Fl. Chile 2: 80 (1898); not Roth ex Sprengel (1826).

Phaca cryptantha Philippi, Fl. Itin. Tarapaca. 14 (1891). — Type from between Aguas Calientes and Socaire (prov. Antofagasta, east of Salar de Atacama), 3000 m. alt., *Philippi*. — Not *Astragalus cryptanthus* Wedd. (1861).

?*Astragalus clandestinus* var. *Flossdorfii* Hicken, Darwiniana 1: 28 (1922). — Type from Queb. de Encrucijada, Sierra Famatina, La Rioja, 4000 m. alt., March 1913, *Flossdorf*.

RANGE: In Chile known only from the puna in eastern Antofagasta. In Argentina ranging at high altitudes from Salta (and Los Andes) south to Tucuman and San Juan.

CHILE. Antofagasta: Atacama Desert (betw. Ag. Calientes and Socaire?), Jan. 1885, *ex Philippi* as *P. cryptantha* (BD); Aguada Veras, 4000 m. alt., *Werdermann 1034* (G, K, US, BD); Cord. Domeyko, 1925, *Berninger 487* (BD); Atacama Desert (Valle Sandon?) *Philippi* as *P. clandestina* (K, DB, Boiss); Guanaqueros to Agua Delgada, Feb. 5, 1901, *Reiche* as *A. bolivianus* (G, BM).

ARGENTINA. Salta: Cerro de Cachi, 4000–4500 m. alt., 1927, *Venturi 6703* (US). Catamarca: Cerro Yutuyaco, north of Andalgala, 3500 m. alt., *Joergensen 1627* in pt. (US); Sierra Anconquija, 4600 m. alt., 1924, *Venturi 6624* (US); Junta de los Reales Blancos, 1930, *Castillanos 30498* (G). Tucuman: Las Lagunas, dept. Tafi, 4400 m. alt., 1933, *Parodi 10829* (G); Cumbres Calchaquies, dept. Tafi, 4000–4400

m. alt., 1933, *Burkart 5399*, *5400* and *5401* (G); Est. Santa Rosa, dept. Chicligasta, 4600 m. alt., 1925, *Venturi 4008* (US); Est. Las Pavas, dept. Chicligasta, 3500 m. alt., 1926, *Venturi 4711* (US); El Pelado, 1912, *Rodriguez 450* (G). La Rioja (Sierra Famatina): Alto Blanco, 1928, *Castillanos 28 188* (G); Mina Jareta, 1879, *Hieronymus & Niederlein 806* (K, BD); between Mina Jareta and Alto de Espiritu Santo, 1879, *Hieronymus & Niederlein 795* (BD); Cueva de Perez, 1879, *Hieronymus & Niederlein 358* (BD); Tocino Pass, 4320 m. alt., 1915, *Hosseus 1911* (BD); below Tocino Pass, 3900–4320 m. alt., 1915, *Hosseus 1903* (BD). San Juan: Paramillo, southwest of San Juan, Jan. 1876, *Echegaray* (BD); Cord. Colangüil, Queb. del Salto, 1930, *Perez-Moreau 30/104* (G).

A plant much resembling *A. geminiflorus* of Ecuador in gross habit. That northern plant, however, has an incompletely 2-celled fruit with the lower suture inflexed, smaller more crowded distinctly silvery silky leaflets, short petioles, and a somewhat more trailing habit of growth. I do not believe that there is any close relationship between *A. geminiflorus* and *A. cryptobotrys*. The latter, in any case, has its closest relations in *A. crypticus* and *A. Asplundii*. Reiche has cited *Phaca diminutiva* Phil., which was collected with the type of *P. cryptantha* Phil., as a synonym of the present species. The plants described as *A. diminutiva*, however, seem so very much smaller than the most reduced forms of the present species known to me that I hesitate to accept it as a synonym. In any case the name cannot be transferred to *Astragalus* since the resulting binomial is preoccupied by another valid species.

27. **Astragalus Asplundii**, sp. nov.

Herba perennis incana; caulibus numerosis e caudice humili laxe ramoso orientibus 5–10 cm. longis simplicibus tomentosis, internodiis 3–20 mm. longis; rhachi folii 4–8 mm. longo; foliolis 5–8-jugis lanceolatis vel lanceolato-ovatis 3–10 mm. longis 2–4 mm. latis basim versus latioribus apicem versus gradatim attenuatis concoloribus planis utrinque villoso-tomentosis; stipulis laxe ochreaceis grandis chartaceis 4–6 mm. longis; pedunculis axillaribus 5–15 mm. longis quam foliis conspicue brevioribus laxe ascendentibus ad apicem flores 3–7 capitato-congestos productis; calycibus subsessilibus ca. 5 mm. longis, lobis subulatis ca. 2 mm. longis; corolla ca. 14 mm. longa; leguminibus sublenticularibus dense villoso-strigosis unilocularibus 6–7 mm. longis 5–6 mm. altis 3–4 mm. crassis sub medium crassioribus et altioribus basi oblique rotundis apice obtusis margine angulatis vix inflexis.

BOLIVIA: Uyuni, Potosi, 3700 m. alt., March 24, 1921, *Asplund 6132* (type, U. S. Nat. Herb.) and *3093* (Upsala); Uyuni, 3700 m. alt., March 25, 1921, *Asplund 6131* (US) and *3161* (Upsala); Uyuni, 3660 m. alt., Feb. 23, 1903, *Hicken 12* (Stock).

A very distinct species with evident relations in *A. cryptobotrys*. From the latter it differs in its larger more elongate acute leaflets and its clustered flowers borne on obvious axillary peduncles. The species is known only from one locality in southern Bolivia, lying several hundred kilometers to the north of the range of its relative.

28. **Astragalus bellus** (Kuntze) Fries, Nova Acta R. Soc. Sci. Upsala IV, 1[1]: 135 (1905).

Phaca pulchella Clos in Gay, Fl. Chile 2: 92 (1846); Weddell, Chlor. Andina 2: 263 (1861). — Type from Cordillera de los Patos, *Gay 490*.

Astragalus pulchellus (Clos) Reiche, Anal. Univ. Chile 97: 539 (1897), and Fl. Chile 2: 82 (1898). Not Salisb. (1796), nor Boiss. (1843).

Tragacantha bella Kuntze, Rev. Gen. 2: 940 (1891). Based upon *P. pulchella* Clos.

RANGE: Known only near the Chile-Argentine boundary, between the provinces of Coquimbo and San Juan.

CHILE-ARGENTINE BOUNDARY: Cordillera de los Patos, rare about the base of scattered rocks, 3100 m. alt., *Gay 490* (type, Paris); Chile, *Gay* (G, K, BD).

A small depressed plant with silky strigose stems and leaves. The strigose fruit is several-seeded, compressed about the margins, and nearly as broad as long. The peduncles are 1–3 mm. long and bear loose clusters of several flowers. The pedicels are about 1 mm. long. The species seems to be most closely related to *A. cryptobotrys* but has much more slender stems, smaller stipules, and less compressed legumes which are compressed about the margins.

29. **Astragalus tehuelches** Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 268 (1902). — Type from Rio Chico, Chubut, *Ameghino*.

RANGE: Known only from southern Patagonia (Chubut).

ARGENTINA. Chubut: Rio Chico, 1900, *Ameghino* (type, Speg.); Chubut, Dec. 1900, *collector not given* (Speg.).

A very distinct species and one very readily recognizable by its coarse, rather fleshy, conspicuously emarginate leaflets and its elongate fruit 2.5–3 cm. long. The pod is narrowed at both ends and is somewhat falcate, the lower margin being concave and the upper one convex in lateral outline. The lower suture is strongly inflexed. There is a very narrow incomplete hyaline false septum. The corollas of the species have not been seen. The coarse calyx, however, suggests that the corollas are probably 10–15 mm. long. The species may have its closest relative in the very different *A. Ruiz-Lealii* of Mendoza.

30. **Astragalus chubutensis** Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 266 (1907). — Based upon collections made by Illin on the Rio Chubut (near Lago Musters) and Rio Carren-leofu.

RANGE: Known only from Chubut and northern Santa Cruz, Patagonia.

ARGENTINA. Chubut: Rio Chubut near Lago Musters, "campo alto cerca del primer manantial," 1899, *Illin* (type, Speg.); Carren-leofu, 1900, *Illin* (Speg.). Santa Cruz: Caleta Oliva, 325 m. alt., Oct. 23, 1929, *Donat 178* (G, NY); Minerales, 300 m. alt., Oct. 23, 1929, *Donat 178* (K, FM, Stock); Lago Argentino, upper Rio Santa Cruz, Jan. 1902, *Hauthal* (Speg.).

A low subcaespitose plant with the numerous leaf-bearing shoots 1–2 cm. long. The leaves, stems, peduncles and calyces are densely appressed villous. This indument is white except on the calyces and stipular sheathes where black hairs may be numerous. The peduncles are 3–5 cm. long and evidently surpass the numerous more or less basal leaves. They are terminated by a capitate cluster of 3–8 blue flowers which become reflexed after anthesis. No mature fruit has been seen. Hauthal's collection, however, has immature fruits which suggest that when mature they would be about 1 cm. long, straight, and only incompletely exserted from the calyx.

31. **Astragalus distinens** Macloskie, Fl. Patagonia 2: 505 (1905). — A renaming of *A. distans* Gray, not Fischer.

Astragalus distans Gray, Bot. U. S. Explor. Exped. 1: 412 (1854). Not Fischer (1853). — Type collected by Pickering on the dunes at the mouth of the Rio Negro, northern Patagonia.

RANGE: From the Rio de la Plata westward and northwestward to San Luis and Jujuy, and southward, probably in the interior, to the lower Rio Negro.

ARGENTINA. Rio Negro: dunes near mouth of Rio Negro, *U. S. Explor. Exped.* (type, US, G). Buenos Aires: Barrancas del Cazador near Escobar, Nov. 23, 1924, *Doello-Jurado 24/1891* (G); Campana, limy barrancas along the Rio Parana, fl. bluish, *Parodi 4736* (Parodi) and *8609* (G); *Burkart 3080* and *5661* (G); *Hauman 13807* (G); *Castellanos 26/1912* (G). Santa Fe: Arroyo Frias, south of Rosario, fl. blue, Oct. 1929, *Cabrera 931* (Stock, G). Corrientes: without locality, 1821, *Bonpland* (Paris). Cordoba: Achiras, fl. bluish white, 800 m. alt., 1930, *King 735* (BM); Capilla por Los Cocos, Nov. 1915, *Hauman 13789* (G). San Luis: Cerro del Portezuelo, Nov. 1820, *Gillies* (K); San Luis, Jan. 1910, *Spegazzini* (Speg); La Guardia, March 23, 1882, *Galander* (BD). La Rioja: near Los Corrales, Sierra Famatina, 1879, *Hieronymus & Niederlein* (BD). Catamarca: Sierra del Anconquija, dept. Santa Maria, fl. yellowish, in rocky places, 4200 m. alt., Jan. 1926, *Venturi 6628* (US); [?] Los Hoyitos, Feb. 7, 1930, *Castellanos 30 491* (G). Tucuman: betw. Amaicha and El Molle, dept. Tafi, dry place, fl. dark blue, Feb. 3, 1933, *Burkart 5393* (G); between Amaicha and El Molle, 2400 m. alt., fl. pale blue, Feb., 1933, *Burkart 5391* (G); Amaicha del Valle, dept. Tafi, 2300 m. alt., dry rocky valley, fl. violaceous white, Jan. 31, 1933, *Burkart 5392* (G). Jujuy: Tilcara, "en los pajonales del cerro," fl. white, 3000 m. alt., Feb. 19, 1927, *Venturi 7422* (US); Cerro La Solidad, dept. Humahuaca, "en los pastigales," fl. bright blue, 3000 m. alt., Jan. 23, 1929, *Venturi 8894* (G, US).

URUGUAY. Carasco, Montevideo, Dec. 1869, *Fruchard* (Paris); Montevideo, sandy place, *Gibert 391* (K); Banados de Santiago Vazquez, 1937, *Rosengurtt 554* (G); Arenal Grande, April 1876, *Arechavaleta* (BD); on face of very dry clay banks at Cape Fray Bentos, Rio Uruguay, *Tweedie* (K); Fray Bentos, 1933, *Herter 1833* (G).

The plant here treated is a very distinct one which is quickly recognizable by its unique fruit. It is most closely related to the more southerly ranging, coastal *A. Bergii* with which it agrees very closely in all structures save its fruit. The type of *A. distinens* is given by Gray, l.c., as from the "Rio Negro, North Patagonia; on sand-hills" where it is said to have been collected with *A. Bergii* (=*A. distans* var. β Gray, l.c.). Pickering, Geogr. Distr. Animals and Plants 77 (1870), who was one of the collectors, indicates that *Astragalus* was collected on the "tract of sand-hillocks" at the mouth of the Rio Negro and presumably those to the southward of the anchorage at the river mouth. Except for the type, I have seen no material of *A. distinens* labeled as coming from south of northernmost Buenos Aires and northern San Luis. Hauman, Anal. Mus. Nac. Buenos Aires 24: 396 (1913), and Manganaro, Anal. Soc. Cien. Argentina 87: 149 (1919), however, report "*A. Bergii*" in western parts of the province of Buenos Aires (Nuevo Plata, and Rivera) towards the La Pampa boundary. There is a possibility that these records may refer to material of *A. distinens* and so indicate an extension of that species from San Luis and Cordoba southward in the interior towards the lower Rio Negro.

It is difficult to believe that the types of two such closely related species as *A. distinens* and *A. Bergii* could have both come from the mouth of the

Rio Negro. The species concerned are so closely allied that hybridization could be expected if they grew in the same area. The type of *A. distinens* is thoroughly typical of the species as here accepted and is said to have been collected with plants that are equally typical of *A. Bergii*. It was collected by members of the U.S. Exploring Expeditions, under Capt. Wilkes, while the ships anchored at the mouth of the Rio Negro during the final week of Jan. 1839. No other landing was made by the expedition between Rio de Janeiro and the Straits of Magellan. The material of *A. Bergii*, collected by the expedition, probably did come from near the anchorage, since that species has been found there subsequently by various botanists. The material of *A. distinens*, however, was probably collected further north, possibly during some overland excursion made while the ships were at anchor. The material collected of the two species is very mature and has ripened pods. That of *A. distinens* is slightly less matured and not so dried and weathered as that of *A. Bergii*.

32. **Astragalus Bergii** Hieronymus, [Sert. Patagon. 17] Bol. Acad. Nac. Cordoba 3: 343 (1880). — Type from near mouth of the Rio Negro, *Berg 79*.

Astragalus distans var. β Gray, Bot. U. S. Explor. Exped. 1: 412 (1854). — Type from near mouth of the Rio Negro.

RANGE: Known only from the southern parts of the province of Buenos Aires where it seems to be confined to sands near the coast.

ARGENTINA. Buenos Aires: mouth of the Rio Negro, Oct. 2, 1874, *Berg 79* (type of *A. Bergii*, BD); near mouth of the Rio Negro, *U. S. Explor. Exped.* (type, US, G); El Carbon, Carmen de Patagones, Feb. 1898, *Spegazzini* (Speg); Bahia Blanca por San Blas, 1903, *Ameghino 13806* (G); Baterias, Bahia Blanca, Dec. 1901, *Spegazzini* (Speg); Monte Hermoso, 1916, *Carette* (G); Sierra de la Ventana, Nov. 1904, *Dusen 6272* (Stock); Sierra de Curamalal, Arroyo Cochenleufú, fl. blue, Nov. 1939, *Cabrera 5490* (G).

The plant treated here has been confused with that which I have called *A. distinens*. The notes by Spegazzini, Anal. Soc. Cien. Argent. 47: 233 (1899), and by Hauman, Anal. Mus. Nac. Buenos Aires 24: 396 (1913), apply to both species. Manganaro, Anal. Soc. Cien. Argent. 87: 149, fig. 15 (1919), however, while giving a general range that includes *A. distinens*, seems to have figured and described plants referable to *A. Bergii* as here accepted. She states, however, that she examined specimens from Rio Negro, Bahia Blanca, Sierra Ventata and Nueva Plata. I have seen no material from as far north as Nueva Plata (Partido Pehuajo, prov. Buenos Aires). Monticelli, Lilloa 3: 345, fig. 22 (1938), reporting *A. Bergii* from La Pampa, illustrates a plant which seems to represent that species. A specimen from him, collected at Telén, La Pampa, showing flowers but no fruit, bears the annotation "fragmento del ilustrado en mi trabajo." The acceptance of this record would extend the known range of *A. Bergii* from southwestern Buenos Aires northwestward into La Pampa.

The type of *A. Bergii*, which I examined at Berlin, is labeled as collected from the shade of shrubs of the Patagonian campo near the Rio Negro on Oct. 2, 1874. According to Berg, Peterm. Geogr. Mittheilungen 21: 367 (1875), he was on the brig "Rosales" which sailed down the Rio Negro from Carmen de Patagones on Sept. 29, 1874. After a halt of three days

at the mouth of the Rio Negro the vessel arrived at the Rio Santa Cruz on Oct. 8th. On Oct. 2nd, the date on which the type was collected, Berg accordingly must have been at the mouth of the Rio Negro.

I am unable to distinguish flowering, non-fruiting plants of the two species I am calling *A. distinens* and *A. Bergii*. Since Berg's type is at anthesis, and entirely lacks fruit, I have arbitrarily associated the name "*A. Bergii*" with what appears to be the common species about the mouth of the Rio Negro. This application of the name, however, must remain a practical expedient, designed to avoid the coining of a new botanical name, until more collecting is done about the lower Rio Negro or until someone discovers floral or vegetative characters whereby the type of *A. Bergii* can be positively assigned to one or the other of the two species concerned here, for, as noted in my discussion of *A. distinens*, the type of this latter species also came from the mouth of the Rio Negro and possibly may represent the species collected by Berg.

33. **Astragalus Spegazzinii**, nom. nov.

Astragalus Rengifoi var. *lejocarpa* Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 268 (1902).— Type from near the confluence of the Rio Limay and Rio Neuquen, *Spegazzini*.

RANGE: Known only from the upper parts of the watershed of the Rio Negro.

ARGENTINA. Rio Negro: near the confluence of the Rio Limay and Rio Neuquen in dry sandy places, Dec. 1897, *Spegazzini* (type, Speg); near General Roca, valley of the Rio Negro, in clay soil, 1915, *Fischer 145* (G, NY, US, K).

In the flowering condition this plant very much suggests some of the intermediates connecting *A. Amunategui* and *A. patagonicus*. Fischer's plant has been reported as *A. Cruckshanksii* by Hicken, Physis 2: 15 (1915). Spegazzini reported his collection first, Anal. Soc. Cien. Argent. 47: 237 (1899), as *A. Arnottianus* and later, as his proposed new variety, *A. Rengifoi* var. *lejocarpa*. The relations of the species are certainly not with *A. Cruckshanksii* and its allies, nor with *A. Arnottianus*. The fruit is linear, has an inflexed lower suture, and becomes deflexed in age. *Astragalus carinatus* is probably its closest relative. Fischer's plants, collected at anthesis, lack even partially matured fruit. Spegazzini's collection has young fruit. The largest of these are falcate and linear, becoming 2 cm. long, ca. 1.7 mm. high and strongly flattened laterally. The upper edge is concave and the lower is convex in lateral outline.

34. **Astragalus carinatus** (H. & A.) Reiche, Anal. Univ. Chile 97: 557 (May, 1897), and Fl. Chile 2: 100 (1898); Kurtz, Bol. Acad. Nac. Cordoba 15: 511 (July 1897).

Phaca carinata Hooker & Arnott, Bot. Misc. 3: 185 (1832).— Type from below Hornillos, Mendoza, *Cruckshank 89*.

Phaca carinata var. β Hooker & Arnott, Bot. Misc. 3: 185 (1832).

Phaca andicola Gillies ex Hooker & Arnott, Bot. Misc. 3: 185 (1832), in synonymy.

RANGE: Base of the cordilleras of Mendoza; Cordoba; and perhaps Catamarca.

ARGENTINA. Mendoza: below the Hornillos, *Cruckshank 89* (type, Kew); Portez. del Pantanillo and Portez. de la Casa de Piedra, *Gillies* (type of var. β, K); abundant along the descent from Portez. de la Casa de Piedra, *Gillies* (K); Rodeo de los Chacayos, Nov. 3, 1834, *Gillies* (K); near baths of Villa Vicencio, Nov. 15, 1822,

Gillies (K); hills above baths of Villa Vicencio, Nov. 15, *Gillies* (G); Potrerillos. Est. "El Salto," fl. blue, 1900 m. alt., Nov. 1933, *Ragonese 97* (G); Mendoza, Jan. 1910, *Spegazzini* (Speg.); El Alambre Atravezado, Estan. La Vila, Tupungato, *Ruiz Leal 2799* (G); Puesto del Manzano, Tunuyan, 1700–2700 m. alt., *Ruiz Leal 1745* and *2318* (G); Cerro Nevado, dept. San Rafael, *Carette 2555* (G). Cordoba: Capital, *herb. Burkart 2140* (Burkart).

In gross habit this plant frequently suggests forms of the very different *A. Arnottianus*, but may be readily separated by its fruit and by its leaflets which are glabrous on the upper surface. It is a plant of the base of the cordilleras, and not of their higher parts. The fruit is glabrous, deltoid in cross-section, and has its lower surfaces broadly inflexed and flattened. The corolla varies in size from 9–12 mm. in length. The type represents the large-flowered form.

Perhaps referable to *A. carinatus* are some collections from Catamarca (Yacutula, *Schickendantz 61;* Granadillas, *Schickendantz 98* and *104;* Catamarca, *Lorentz 41*) which have a form of corolla slightly different from that in typical plants of Mendoza and Cordoba. Also questionably referred to the present species is a collection made by Perez Moreau (no. 30/97) near Las Vicunitas, Queb. de Conconta, in the cordilleras of San Juan. This latter is a caespitose plant with minute leaflets, about 1 mm. long, and reduced scapes only 5-15 mm. high. It may be a compacted depauperate montane form, comparable to depauperate compacted phases of *A. Arnottianus* that have been collected near El Portillo, Mendoza.

35. **Astragalus Parodii,** sp. nov.

Herba perennis e radice crassa valida profunda oriens; caulibus 3–20 (saepe 5–15) cm. longis foliosis angulatis numerosis gracillimis ca. 1 mm. crassis decumbentibus longe sparseque ramosis sparse brevissimeque strigosis e caudice ramoso 5–10 cm. diametro subterraneo erumpentibus internodiis 3–6 cm. longis; stipulis vix conspicuis 1.5-3 mm. longis infra medium connatis inconspicue strigosis chartaceis, lobis herbaceis saepe reflexis; rhachibus foliorum 1–2.5 cm. longis; foliolis 3–6 jugis medioplicatis oblongo-obovatis vel anguste oblongis 3–10 mm. longis 1–2.5 mm. latis costatis sed enervatis subtus sparse inconspicueque strigosis, supra saepe glabris, apice retusis, infra medium basim versus contractis; racemis 4–7 floris 1–2 cm. longis laxifloris; pedunculis 1–4 cm. longis foliis 1–2-plo longioribus; calycibus 3–4 mm. longis sparse et pallide nigreque strigosis, lobis linearibus quam tubo paulo brevioribus; corolla caerulea; vexillo 8–10 mm. longo, lamina obovata 5–6 mm. lata 5–7 mm. longa apice emarginata; alis 7–8 mm. longis quam carina 1–2 mm. longioribus; leguminibus subovoideis vel oblongis lateraliter compressis angulatis unilocularibus 5–9 mm. longis 2–3 mm. crassis 2–3.5 mm. altis induratis tarde dehiscentibus pendulis, apice acutis et apiculatis, basi rotundis, infra medium vel basim versus crassioribus et latioribus, dorse acutis et summam ad marginem incrassatis et paulo compressis, subtus planis vel leviter subintrusis; suturis prominentibus; seminibus congestis ca. 10.

RANGE: Known only from the Sierra de Achala, Cordoba. All collections seem to be from the Dept. Punillo near Los Gigantes.

ARGENTINA. Cordoba: base of Los Gigantes, Dec. 2, 1878, *Hieronymus* (BD); Quebrada at base of Los Gigantes, Jan. 22, 1880, *Galander* (BD); near

Esquina, in quebrada at base of Los Gigantes, Dec. 3, 1878, *Hieronymus* (BD) and Jan. 1881, *Hieronymus* (BD); valley of the Rio Catre below the potrerillos, Feb. 4, 1877, *Hieronymus 761* (BD, Paris); Cuesta del Gaucho, Jan. 9, 1876, *Hieronymus* (BD); Copina, moist alpine meadows, fl. blue, 1500 m. alt., Dec. 29, 1935, *Burkart 7360* (type, Gray Herb.); between Cuesta de Copina and Las Encenadas, Jan. 8, 1876, *Hieronymus* (BD); near Pampa de Achala, sandy soil, 2000 m. alt., Dec. 1926, *Parodi 7490* (BD); Pampa de Achala, moist meadows, 2200 m. alt., Dec. 29, 1935, *Burkart 7355* (G); Pampa de Achala, 10 km. below Hotel El Condor, rocky plateau, fl. bluish white, 1000 m. alt., Dec. 16, 1938, *Goodspeed 17228* (G).

A very distinct species having its closest affinities probably with *A. carinatus*. It differs from the latter in its smaller, indurate, very much less angulate pods and fewer, somewhat smaller, more congested flowers. Its tough pods also suggest *A. Bergii* and *A. distinens* but these species have much more numerous smaller pale flowers in elongate racemes and curved pods with at least one suture recessive. In lateral outline the pods of *A. Parodii* are strongly convex above and nearly straight below. In cross-section they are roughly triangular. Their upper edge is prominent being compressed laterally and slightly thickened along the suture. The pods are flattened or weakly and broadly intruded dorsally. The legumes of this species dehisce only very tardily if at all.

36. **Astragalus Joergensenii**, sp. nov.

Herba perennis gracilis laete viridis erecta vel decumbens; caulibus 1.5–7 dm. longis sulcatis sparse strigosis longe ascendenter ramosis foliosis; foliolis 8–11-jugatis ellipticis vel lanceo-oblongis 3–11 mm. longis 2–4 mm. latis apice obtusis vel retusis subtus strigosis supra glabris margine plus minusve involutis; pedunculis 4–7 cm. longis foliis aequilongis vel paulo longioribus apicem versus flores congestos gerentibus; floribus violaceis maturitate deflexis; calycibus cupulatis 1–1.5 mm. profundis nigro-strigosis ca. 1 mm. longe pedicellatis, lobis angustis tubo subaequilongis; vexillo 5–7 mm. longo; alis carina evidenter longioribus; ovario strigoso; leguminibus unilocularibus refractis 1.5–2 cm. longis 2–4 mm. altis sparse strigosis falcatis chartaceis valde angulatis supra carinatis subtus conspicue lateque inflexis 1–3 mm. crassis; seminibus numerosis.

RANGE: Northwestern Argentina at middle altitudes.

ARGENTINA. Catamarca: Poman, Dec. 1909, *Spegazzini* (Speg); El Candado, common, Feb. 10, 1917 and Jan. 20, 1916, *Joergensen 1123* (US) and *1126* (type, Gray Herb.). Tucuman: sierras near Tafi del Valle, fl. blue-violet, 2400 m. alt., Feb. 3, 1933, *Burkart 5404* (G); Estan. Santa Rosa, Pueblo Viejo, dept. Chicligasta, among grass on ridge, fl. violet, 4000 m. alt., Dec. 22, 1925, *Venturi 7513* (US). Salta: Cerro de Cachi, dept. San Carlos, among grass, fl. bluish, 3500 m. alt., March 11, 1917, *Venturi 6697* (US); Cerro de Cachi, fl. violet, 3500 m. alt., March 10, 1917, *Venturi 6696* (US); Pampa Grande, Jan. 1897, *Spegazzini* (Speg); Amblaio to Cachi, Jan. 1897, *Spegazzini* (Speg). Jujuy: Tilcara, en los pajonales del cerro, fl. violet, 3000 m. alt., Feb. 18, 1927, *Venturi 7419* (US); Maimora, dept. Tilcara, fl. pinkish yellow, in gravel, 2500 m. alt., Feb. 15, 1927, *Venturi 10411* (US); Volcan, dept. Tumbaya, grassy place, fl. bluish, 2300 m. alt., Jan. 20, 1926, *Venturi 9180* (US).

In the mountainous regions of northern Argentina this plant has been confused with the form of *A. distinens* found in the same area. It is not closely related to that species, however, differing conspicuously in the

structure of the fruit and usually in the color as well as form of the corolla. The pods, though averaging somewhat smaller, are similar in structure, texture and shape to those of *A. carinatus*. It is probably in the evidently different and more southerly ranging *A. carinatus* and *A. pauranthus* that our present species finds its closest relatives.

37. **Astragalus pauranthus,** sp. nov.

Planta humilis ascendens e radice gracili profundi perenni erumpens; caulibus pluribus gracillimis 1–2 dm. longis strigosis sparse ascendenter ramosis foliosis; rhachibus folii 2–5 cm. longis; foliolis distantibus 5–7-jugatis 3–7 mm. longis 1–3 mm. latis linearibus vel oblongis supra glabris subtus strigosis apice saepe retusis; pedunculis 5–10 cm. longis foliis subduplo longioribus supra medium laxifloris; floribus 3–8 distantibus pallidis; vexillo 5–7 mm. longo; alis carina conspicue longioribus; calycibus 2 mm. longis campanulatis nigro-strigosis, lobis gracilibus tubo paulo brevioribus; ovario glabro; leguminibus refractis glabris 12–15 mm. longis 3–4 mm. altis basim versus rotundis apice obtusis supra carinatis saepe rectis vel (a latere viso) plus minusve concavis subtus late inflexis 2–3 mm. crassis.

RANGE: Patagonia.

ARGENTINA. Rio Negro: General Roca, on dunes at foot of the barrancas on the north side of the valley of the Rio Negro, Oct.–Nov. 1914, *Fischer 99* (type, Gray Herb.; US, NY, FM, K, BD). Chubut: Carren-leofu, 1900, *Illin* (Speg); Chubut, 1899, *Illin* (Speg); Chubut, 1900, *Basaldua* (Speg).

The collections made by Illin and Basaldua were those cited as *A. Bergii* by Spegazzini, Anal. Mus. Nac. Buenos Aires 7: 265 (1902). That species, which is known only to the east and north of the range of *A. pauranthus*, is a very different plant. Our species may be separated from it by the few differently shaped flowers, the more slender more lowly habit of growth, and the chartaceous fruits with broadly and strongly inflexed lower suture. The affinities of *A. pauranthus* are with *A. Bergii*, *A. Joergensenii*, and possibly *A. Ruiz-Lealii*.

38. **Astragalus Ruiz-Lealii** sp. nov.

Planta gracillima annua strigosa cinerea; caulibus basi sparse ramosis erectis 5–15 cm. altis ca. 1 mm. crassis; foliis caulinis, rhachibus folii 2–5 cm. longis sursum 4–12 mm. supra basim efoliolatis; foliolis distantibus 5–7-jugatis 2–9 mm. longis 1–2 mm. latis linearibus vel oblongis, apice emarginatis vel obtusis, supra strigosis vel costam versus plus minusve glabris, margine involutis; pedunculis rhachibus folii subaequilongis apicem versus laxe bifloris; floribus flavaceis 0.5–1 mm. longe pedicellatis; calycibus ca. 3.5 mm. longis cum pilis pallidis et non rariter nigris strigosis, tubo ca. 2 mm. longo ca. 1.3 mm. crasso, lobis ca. 1.5 mm. longis gracilibus; vexillo 6–7.5 mm. longo apice emarginato, alis ca. 5 mm. longis quam carina ca. 1 mm. longioribus; ovario strigoso; leguminibus vix induratis plus minusve reflexis pallide strigosis 2–2.5 cm. longis utroque attenuatis gracilibus 6–10-plo longioribus quam latis falcatis, margine superiore (a latere viso) convexis secus sutura prominente paulo compressis, margine inferiore (a latere viso) concavis valde inflexis; seminibus numerosis.

RANGE: Known only from Mendoza.

ARGENTINA. Mendoza: Mendoza, Jan. 1910, *Spegazzini* (Speg); dry rocky places near Mina La Atala, dept. Las Heras, Nov. 1, 1936, ***Ruiz Leal 4200*** (G); bed of Rio Papagayos near Queb. de la Mina La Atala, Oct. 24, 1937, *Ruiz Leal 3343* (type, Gray Herb.); near Queb. de la Mina La Atala, Sept. 20, 1937, *Ruiz Leal 4676* (G); Km. no. 59, Paso de la Cumbre, dept. Lavalle, Sept. 20, 1938, *Ruiz Leal 5297* (G).

A very distinct species characterized by its very slender stems, its annual root, few flowers, and elongate extrorsely falcate pods. In having extrorsely falcate pods which become deflexed, the species can be compared only with the very different *A. tehuelches* of southern Patagonia. The seminiferous (superior) suture of the fruit is strongly convex in lateral outline and not concave nor straight as is prevalent in this genus. The valves are laterally compressed just below the superior suture and then somewhat swollen. The lower suture is abruptly and distinctly inflexed. There is a very narrow hyaline incomplete false septum inside the pod. The species is probably most closely related to *A. tehuelches* and *A. pauranthus*, but has smaller and fewer flowers, more slender stems, and a distinctly annual root. The collection by Spegazzini, cited above, was mixed with material of *A. carinatus* and is part of collection no. 2146 in his herbarium at La Plata.

TO BE CONTINUED

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ASTRAGALUS IN ARGENTINA, BOLIVIA AND CHILE

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Continued from p. 374

39. **Astragalus Monteroi,** sp. nov.

Herba prostrata; caulibus 2–4 dm. longis 1–2 mm. crassis sparse inconspicueque strigosis sparse longeque ramosis foliosis, internodiis 3–5 cm. longis; foliis superioribus paulo reductis; rhachibus foliorum 3–5 cm. longis sparse strigosis partibus basalibus efoliatis 0–15 mm. longis; stipulis chartaceis ocreatis 2.5–5 mm. longis, lobis 1–2.5 mm. longis; foliolis 6–9 jugatis carnosulis obcordatis vel oblongo-obcordatis supra medium vel medium versus latioribus apice retusis basi acutis supra glabris subtus glabratis vel praesertim in margine et costa strigosis costatis sed enervatis 5–14 mm. longis 4–7 mm. latis 0.5–1 mm. longe petiolulatis; pedunculis 3–6 cm. longis cum floribus 8–20 congestis terminatis; calycibus 4–5 mm. longis sparsissime strigosis tubo 2–2.5 mm. longo lobis 1–2 mm. longis angustis pedicello 1–2 mm. longo; vexillo 9–10 mm. longo 8 mm. lato apice retuso 1–2 mm. longe unguiculato medio albo et caeruleo-striato alibi caeruleo; alis flavescentibus quam carina 1 cm. longa ultra medium caerulea 2–2.5 mm. brevioribus; ovario glaberrimo; leguminibus glabris pendulis congestis 11–14 mm. longis oblongis acuminatis supra acutis subtus planis 3–4 mm. crassis, a latere viso supra leviter concavis et subtus valde concavis.

CHILE. Cautin: Puerto Saavedra, 3 m. alt., Feb. 30, 1932, *G. Montero 1161* (type, Gray Herb.); Llaima, Jan. 1925, *Claude Joseph 3118* (US); Budi, Feb. 1928, *Claude Joseph 4878* (US).

In gross habit and in corolla structure the present species much suggests the coarse forms of *A. palenae* (i.e. the var. *grandiflora* Speg.). The fruit of *A. Monteroi*, however, is very different from that of *A. palenae* and very much more like that found in *A. amatus* of the coast of central Chile. The closest relative of *A. Monteroi* is evidently *A. amatus*. From this species it is quickly distinguished by its glabrous ovary and fruit. It is a coarser and much larger plant with much larger more fleshy leaves. The species seems to be very well marked.

40. **Astragalus amatus** Clos in Gay, Fl. Chile 2: 115 (1846). — Type given as from Porfiro, on road from La Serena to Arqueros, 1433 m. alt., *Gay 269*.

Astragalus procumbens Hooker & Arnott, Bot. Beechey Voy. 18 (1830), and Bot. Misc. 3: 186 (1832); Hooker, Bot. Mag. 60: t. 3263 (1835); Reiche, Anal. Univ. Chile 97: 540 (1897), and Fl. Chile 2: 83 (1898). — Not Miller (1768). — Given as collected by *Lay and Collie* at "Conception," Chile.

Phaca tricolor Clos in Gay, Fl. Chile 2: 105 (1846). — Based upon collections (devoid of geographical data) said to have come from the coast of Coquimbo and Aconcagua.

Astragalus tricolor (Clos) Reiche, Anal. Univ. Chile 97: 550 (1897), and Fl. Chile 2: 93 (1898). Not Bunge (1868–69).

Astragalus ferrugineus Clos in Gay, Fl. Chile 2: 114 (1846); Weddell, Chlor. Andina 2: 262 (1861); Reiche, Anal. Univ. Chile 97: 567 (1897), and Fl. Chile 2: 110 (1898). — Based upon material (mixed and probably mislabeled) given as from near Cauquenes, *Gay 237*.

Astragalus leucomallus Philippi, Linnaea 30: 186 (1859). — Based upon material from coast near Topocalma, prov. Colchagua, *Gay 527* and *Volckmann*.

Phaca brachyptera Philippi, Linnaea 33: 44 (1864). — Type collected near Catemu, prov. Aconcagua, *Philippi*.

Astragalus brachypterus (Phil.) Reiche, Anal. Univ. Chile 97: 541 (1897), and Fl. Chile 2: 84 (1898). — Not Fischer (1853).

Astragalus litoreus Philippi, Linnaea 33: 46 (1864); Reiche, Anal. Univ. Chile 97: 540 (1897), and Fl. Chile 2: 83 (1898). — Type collected on the coast near Coronel, 1861, *F. Philippi*.

Tragacantha brevialata Kuntze, Rev. Gen. 2: 940 (1891). — A new name based upon *P. brachyptera* Phil. (1864); *A. brachyptera* Reiche (1897), not Fischer (1853).

Astragalus chilensis Sheldon, Minnesota Bot. Studies 1: 157 (1894). — A new name based upon *A. procumbens* H. & A. (1830), not Miller (1768).

Astragalus subandinus Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902). — A new name based upon *P. brachyptera* Phil.; *A. brachypterus* Reiche (1897), not Fischer (1853).

RANGE: West-central Chile, from the province of Concepcion north to the province of Coquimbo, along the ocean and east into the coastal mountains.

CHILE. Coquimbo: hills of decomposed basanite near Porfiro, road between La Serena and Arqueros, 1433 m. alt., *Gay 269* (Paris, type of *A. amatus*); Coquimbo, *Cuming 881* (K); Andocollo, Oct. 1926, *Claude Joseph 4533* (US); Est. Fray Jorge, 215 m. alt., *Skottsberg 786* (Stock, Gottenburg); Fray Jorge, 1935, *Muñoz 137* and *165* (G); Punta del Viento, Fray Jorge, 400 m. alt., 1925, *Werdermann 916* (G, BD); Cuesta de Cavilolén, ca. 30 km. s. w. of Illapel, steep banks, standard blue-purple, wings white, 500 m. alt., *Worth & Morrison 16465* (G). Aconcagua: Zapallar, Sept. 17, 1917, *Johow* (G); Cerro de la Cruz, Zapallar, *Behn* (Behn); Punta de Quintero, cliffs, *Poeppig 189/307* (BM, BD); Quintero, *Werdermann 1* (G, BD); mountains [above Catemu] *Philippi* (BD, isotype of *P. brachyptera*); Concon, *Poeppig 190, 257* and *188 211* (BD, Paris); Playa de Concon, sand, 1937, *Jaffuel & Pirion 3946* (G); Viña del Mar, dunes, 1830, *Bertero 1824* (G, NY, BD, Paris); Valle de Marga Marga, 40 km. inland, 250 m. alt., 1929, *Jaffuel 247* and *3021* (G); Las Zorras, 1917, *Skottsberg 1038* (Stock, Gottenburg); Playa Ancha, 1829, *Bertero 823* (Paris); hillside, Queb. Jaime, Valpo., Nov. 1895, *Brenning 129* (BD); El Alto, hillside, 1830, *Bertero 1821* (G, Paris); Laguna Verde, 1930, *Garaventa 2122* and *2129* (G). Santiago: San Antonio, dunes, Sept. 1829, *Gay 469* (Paris). Colchagua: Matanzas, March 1894, *Philippi* (G, LP); near stream, Cauquenes, Feb. 1831, *Gay 237* (Paris, type of *A. ferrugineus*). Talca: Llico, Dec. 1861, *ex Philippi* (LP); Iloca, Feb. 1931, *Fuentes* (G). Concepcion: Coronel, seashore, Feb. 1861, *F. Philippi* (G, isotype of *A. litoreus*); Coronel, *ex Philippi* as *A. litoreus* (BD); Talcahuano, Dec. 1861, *herb. Reed* (K); Quiriquina, Nov. 1924,

Claude Joseph 2855 (US); San Miguel, Nov. 1933, *Barros 137* (G); Concepcion, *Cuming 137* (K); Concepcion, Sept. 1895, *Neger* (BD); prov. Concepcion, ex Philippi as *A. litoreus* (Boiss, Stock); San Vicente, Dec. 1894, *Philippi* (G). Indefinite: "Chile," *Gay sine no.* and *Gay 584* (Paris, type of *P. tricolor*); "Chile," *Gay* as *P. tricolor* (G, K, BD).

Assembled here under the name *A. amatus* is a very variable group of plants of western Chile, found from the provinces of Concepcion to Coquimbo, and characterized by having the wings of the corolla conspicuously shorter than the keel. The group of forms is very readily recognizable and has a close relative only in *A. Monteroi* of the coast of southern Chile. Possibly it may be a complex of local species. The material available to me, however, is inadequate for an attempted analysis of it at this time.

Certain of the phases of *A. amatus* deserve special comment. There is an erect plant of the coastal mountains, somewhat back from the ocean in the province of Aconcagua, which has small ovate or oblong leaflets which are markedly and gradually diminished in size upwardly along each leaf-rhachis. Its corollas appear to be a darker blue than in the forms from other regions. This plant is typical *A. amatus* and is that described as *P. brachyptera* by Philippi. I have seen collections of it from Porfiro, Andacollo and Catemu.

The other forms of *A. amatus*, sensu lat., are decumbent or prostrate and appear to grow near the ocean or in the coastal hills under more marked maritime influence. The most striking of these spreading forms is a white-tomentose plant with coarse stems and thickish broad ovate leaflets which appears to be restricted to sands and dunes along the ocean. This extreme form has been described as *A. leucomallus* Phil. Though very conspicuous in its extreme development the tomentose plant seems to intergrade with the common, excessively variable and more mesophytic forms of the fields and slopes back from the sea. These latter vary in coarseness of stems and in size and shape of the leaves. Their leaflets may be subcordate to linear or narrowly elliptic, appressed villous to nearly glabrous, 3–15 mm. long, 2–6 mm. broad, and their apices from obtuse to retuse. They present, accordingly, considerable variation in gross aspect. To this complex of forms belong the names, *A. procumbens* H. & A., *A. litoreus* Phil. and *A. tricolor* Clos, the first to the much collected form north and south of Valparaiso, the two latter names to the small-leaved glabrescent slender-stemmed laxly decumbent phase which prevails in the region about Concepcion.

The type of *A. procumbens* H. & A., which I could not find at Kew, is said to have been collected at Concepcion by Lay and Collie. It is said to have elliptic retuse leaflets which are "tomentoso-hirsutis" or "sericeo-villosus." I have seen no such plant from near Concepcion, where the glabrescent forms such as *A. tricolor* and *A. litoreus* seem to predominate or, at least, have been most collected. The original description of *A. procumbens* fits best the plants found on the slopes about Valparaiso.

The type of *A. amatus* Clos is a mixture of two very different forms. The label on the type collection (*Gay 269*) gives the source of the plants as Porfiro, 1000 m. alt., in the mountains northwest of Coquimbo. Of the two forms mixed under *Gay 269*, one is indistinguishable from the spreading densely white-tomentose plant of the coastal sands which Philippi later called *A. leucomallus*. The other plant, erect, cinereous and appressed villous (rather than tomentose) and bearing more numerous (9–15) smaller strongly truncate or retuse leaflets, is most like the type of *A. brachypterus* (Phil.) Reiche. This latter is the form which has the numerous leaflets noticeably reduced in size up each leaf-rhachis and the one known only away from the ocean in the coastal hills of Coquimbo and Aconcagua. In his discussion of *A. amatus* Clos distinguishes these two forms, mentioning first the erect plant of the interior and second the spreading white-tomentose plant of the coastal sands. In his description of the species, however, the tomentose dune-form seems to be somewhat emphasized. In this connection it may be noted that, at Paris, Clos has identified *Bertero 1821* as "*A. amatus*." This particular collection by Bertero is the tomentose dune plant. Since, however, Clos identified other very similar collections of the white-tomentose dune-form as "*A. procumbens*," I cannot attach any importance to his identification of the collection of Bertero mentioned.

Not only are the collections of "*A. amatus*" mixed in the herbarium at Paris, but so are the duplicate collections of the species distributed to other herbaria. For example, at Berlin there are two sheets of "*A. amatus*," one is entirely the tomentose dune plant and the other is a mixture of *A. nudus* and *A. vesiculosus*. The sheet of "*A. amatus*" at New York is the tomentose dune plant. At the Gray Herbarium the sheet of "*A. amatus*" is a mixture of the erect plant of the interior (i.e., *A. brachypterus*) and *A. nudus*. Similar mixtures are found in other herbaria. It may be noted here that the material of the dune-form forming a part of the mixed type of *A. ferruginosus*, in appearance, discoloration, maturity, manner of preparation, etc., is so very much like that mixed in the type collection of *A. amatus*, that I am confident that they were collected and prepared at the same time and are parts of a single dissociated collection. This would mean that the material of this particular collection of the coastal dune-form was not only divorced from its proper label but was also separated and improperly associated with collections of other forms of *A. amatus* from different localities. There is plenty of evidence that some of Gay's collections did get mixed. In the present case of "*A. amatus*" it seems clear that the label on the type at Paris could apply only to the plant of the interior (i.e., *A. brachypterus*) collected at Porfiro, and that the material of the white-tomentose dune form must be extraneous. Hence, because in his publication Clos discussed the erect plant of the interior before mentioning the spreading plant of the dunes, and since there is every reason for believing that the plant of the interior, rather than the coastal dune form, will be found at

Porfiro, the locality given on the associated label, I believe that the erect plant of the interior should be accepted as the typical element in the complex type of *A. amatus*.

The type collection of *A. ferrugineus*, at Paris, is a mislabeled mixture. The type-sheet contains a plant of the tomentose dune form (i.e., *A. leucomallus*) and one of the slender glabrate forms similar to those found about Concepcion (i.e., *A. tricolor* and *A. litoreus*). These are obviously parts of two different collections made at different places. The label is, with the exception of the plant-name added by Clos, entirely written by Gay. It reads, "237, Provincia Colchagua, Astragalus ferrugineus Clos ad rivulos, Cauquenes, februario 1831, fl. septembri, etc., frequens, t. basaltique, (Chili)." During February 1831 Gay was exploring along the Rio Cachopoal and visited Baños de Cauquenes and the Estancia de Cauquenes in the province of Colchagua. This area, at the base of the cordilleras, however, is far beyond the known range of the coastal *A. amatus* and its forms. They are not known, nor to be expected, east of the coastal mountains, within 100 km. of Estancia de Cauquenes. The material on the type-sheet, hence, represents parts of two different collections (probably from the dunes near Valparaiso and from the coast near Concepcion), which are improperly associated with the label belonging to an unknown third plant. Though Clos, in his description of *A. ferrugineus*, seems to be concerned only with the tomentose dune form, the type collection is so badly mixed that I believe the species had best be discarded as a nomen confusum.

The type material of *P. tricolor*, at Paris, consists of two sheets devoid of any precise geographical data. This type-material and the original description agree well with plants collected in the coastal area of the province of Concepcion. When *A. tricolor* was described, however, it was given as growing near the coast in the provinces of Coquimbo and Aconcagua. Among the many collections which I have seen from the coast of Aconcagua and Coquimbo none are similar to the original material of *A. tricolor*. I am confident that the type-material of *A. tricolor* really came from the region about Concepcion.

41. **Astragalus valparadisiensis** Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902). — A renaming of *A. trifoliatus* Phil.

Astragalus trifoliatus Philippi, Linnaea 28: 681 (1857); Reiche, Anal. Univ. Chile 97: 543 (1897), and Fl. Chile 2: 86 (1898). Not Boiss. (1843). — Type originally said to be from the Andes of the province of Santiago. Reiche, however, gives it as from "Algarrobo," on the coast of Aconcagua.

CHILE. Aconcagua: Valparaiso, *ex Philippi* dedit. 1876, as *A. trifoliatus* (BD, Del); Valparaiso, *no collector given*, as *A. trifoliatus* (Speg.).

I know this plant only from descriptions and from the collections, all evidently duplicates of one gathering, above cited. It is a very distinctive plant with its trifoliate leaves, coarse loose stipular sheathes and very dense abundant long silky golden indument. It is to be noted that in the literature Philippi and Reiche differ as to the origin of this species, the

former giving it as from the cordilleras, the latter as from the coast near Valparaiso. The specimens distributed by Philippi, however, are labeled as from Valparaiso, and this is probably correct. The general habit of the plant suggests an inhabitant of dunes and a close examination of the specimens reveals the presence of clean white sand in the stipular sheathes and among the hairs of the indument. No fruit of the species is known. The original collection shows flowers at anthesis. These much suggest those of *A. nudus* and I suspect that is the closest relative of *A. valparadisiensis*.

42. **Astragalus cachinalensis** Philippi, Fl. Atac. 15 (1860); Reiche, Anal. Univ. Chile 97: 547 (1897), and Fl. Chile 2: 90 (1898); Johnston, Contr. Gray Herb. 85: 52 (1929). — Type collected at Cachinal de la Costa, *Philippi*.

RANGE: Fog-bathed hills and cliffs along the coast of prov. Antofagasta, northern Chile.

CHILE. Antofagasta: Cachinal de la Costa, *Philippi* as *A. cachinalensis* (BD, isotype); near Aguada Grande ("Cachinal de la Costa" of Philippi), 1925, *Johnston 5825* (G, US, K); near Aguada Cachina, 1925 *Johnston 5740* (G); El Rincon near Paposo, 1925, *Johnston 5497* (G, US); Aguada Panul, 1925, *Johnston 5431* (G); near Aguada Miguel Diaz, 1925, *Johnston 5349* (G, US).

A plant with slender elongate trailing leafy stems and very large flowers. The bluish standard becomes 12–18 mm. long. The keel is cream-colored and tipped with bluish. The petals become yellowish when dry. The species is a very distinct one and is restricted to the fog-bathed slopes along the southern half of the coast of the province of Antofagasta. It is obviously an isolated outlying relative of *A. amatus* of central Chile.

43. **Astragalus nudus** Clos in Gay, Fl. Chile 2: 115 (1846); Reiche, Anal. Univ. Chile 97: 546 (1897), and Fl. Chile 2: 89 (1898). — Based upon two collections, dunes near La Serena, *Gay 15*, and between La Serena and Arqueros, 1300 m. alt., *Gay 270*.

RANGE: Known only from the region about Coquimbo and along the coast in southern Atacama.

CHILE. Coquimbo: Rare, hills of decomposed basanite (near Porfiro), road between La Serena and Arqueros, 1300 m. alt., *Gay 270* (Paris, type); Herradura, 1917, *Skottsberg 1057* (Stock); scattered on dunes near ocean, La Serena, Sept. 1836, *Gay 15* (Paris); Isla Guacolda, Huasco, on sand of island, perennial, standard lavender and white, wings white, Oct. 26, 1938, *Worth & Morrison 16224* (G); Chile, *Gay* as *A. nudus* and *A. procumbens* (K); Chile, *Gay* as *A. amatus*, in pt. (BD); Chile, *Gay* as *A. procumbens* (G, NY).

The corolla of *A. nudus* dries yellowish except for the distal half of the keel which is purplish or blue. When fresh the standard is probably pale bluish and the wings cream-colored. The whole plant is densely strigose and canescent. The stems appear to be erect or ascending. The relationships of the species are with *A. valparadisiensis* and, particularly, with *A. Dodti*. I have not seen the completely mature fruit of this species.

44. **Astragalus Dodti** Philippi, Linnaea 33: 48 (1864), Anal. Univ. Chile 27: 343 (1865), and Anal. Univ. Chile 84: 28 (1893); Reiche, Anal. Univ. Chile 97: 545 (1897), and Fl. Chile 2: 88 (1898). — This species was based upon flowering plants from near Copiapo, *Dodt*, and upon fruiting plants from Arqueros, *Gay*.

Astragalus Rengifoi Philippi, Anal. Univ. Chile 84: 25 (1893); Reiche, Anal. Univ. Chile 97: 544 (1897), and Fl. Chile 2: 87 (1898). — Based upon material collected near Chañarcillo, Sept. 1876.

Astragalus melanogonatus Johnston, Contr. Gray Herb. 85: 52 (1929). — Type from Punta Reyes, prov. Antofagasta, *Johnston 5353*.

RANGE: Gravelly and sandy soils on the coastal desert of Atacama and Antofagasta.

CHILE. Antofagasta: Antofagasta, 1925, *Johnston 3632* (G, US); Punta Reyes near Miguel Diaz, 1925, *Johnston 5353* (G, type of *A. melanogonatus*). Atacama: Morro de Copiapo, southwest of Caldera, sandy washes above beach, flowers pinkish white, Oct. 21, 1938, *Worth & Morrison 16183* (G); Caldera, *Gigoux* (G); Caldera, 1885, *Borchers* (BM); Monte Amargo, 200 m. alt., 1924, *Werdermann 458* (G, K, BD); near Copiapo, Sept. 1854, *Lechler 2805* (K); Chañarcillo, Sept. 1876, *ex Philippi* (G, LP, isotypes of *A. Rengifoi*). Indefinite: Desert of Atacama, *Geisse, sub Morong 98* (NY) and *Morong 1165* (G, NY, US, K); Atacama Desert, *ex Philippi* as *A. Rengifoi* (BD, US); ? Vicuña, Oct. 1926, *Claude Joseph 4597* (US).

This species is prevailingly annual and erect. It is very closely related to *A. nudus* and possibly may not be separable from that more southern species. The legumes are strongly compressed and have nearly parallel sides. They may be permanently strigose or become glabrescent. The corollas of *A. Dodti* and *A. nudus* are very similar in size and form, but the coloration in the latter species is more intense. *Astragalus Dodti* and *A. Rengifoi* are evidently conspecific. The more northern form described as *A. melanogonatus* is essentially similar differing chiefly in the broader, oblong rather than linear, leaflets.

45. **Astragalus Berteri** Colla, Mem. R. Accad. Sci. Torino 37: 55, t. 9 (1832), and Pl. Rarior. Bertero. 19, t. 9 (1831?); Reiche, Anal. Univ. Chile 97: 546 (1897), and Fl. Chile 2: 89 (1898). — Based upon material given as from "locis aridis de la Leona secus rivum Cachapual," collected by Bertero.

Astragalus prostratus Hooker & Arnott, Bot. Voy. Beechey 18 (1830), and Bot. Misc. 3: 187 (1832). Not Scop. (1786–88). — Based upon collections from Concepcion, *Lay* and *Collie*.

Astragalus alberjilla Steudel, Nom. ed. 2, 1: 159 (1840), nomen. Given as based upon *Bertero 65* from prov. Colchagua.

Phaca grata Clos in Gay, Fl. Chile 2: 92 (1846). — Type collected in "Chile" by Gay.

Astragalus gratus (Clos) Reiche, Anal. Univ. Chile 87: 570 (1897), and Fl. Chile 2: 113 (1898).

Astragalus filifolius Clos in Gay, Fl. Chile 2: 111 (1846). — Type collected between La Serena and Arqueros, Oct. 1833, *Gay 141*.

Phaca elongata Philippi, Linnaea 33: 43 (1864). — "In Andibus de Chillan dictus reperitur."

Astragalus elongatus (Phil.) Reiche, Anal. Univ. Chile 97: 568 (1897), and Fl. Chile 2: 111 (1898). Not Willd. (1803).

Phaca concinna Philippi, Linnaea 33: 44 (1864). — "In montibus elatus praedii Catemu prov. Aconcagua inveni."

Astragalus concinnus (Phil.) Reiche, Anal. Univ. Chile 97: 568 (1897), and Fl. Chile 2: 111 (1897).

Astragalus cauquenensis Philippi, Anal. Univ. Chile 41: 691 (1872). — Type from Baños de Cauquenes, prov. Colchagua.

Astragalus pencanus Philippi, Anal. Univ. Chile 84: 30 (1893). — Based upon collections from Cerro de Caracol near Concepcion, Jan. 1887, *Philippi*, and from Hac. de Almendoro, Araucania.

Tragacantha longior Kuntze, Rev. Gen. 2: 941 (1891). — Based upon *P. elongata* Phil. *Astragalus elongatus* (Phil.) Reiche, not Willd. (1803).

Astragalus Rhudolphi Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 265 (1902). — Based upon *P. elongata* Phil., not *Astragalus elongatus* Willd. (1803).

RANGE: Central Chile, along the coast and east to the base of the cordilleras, from Coquimbo south to Concepcion.

CHILE. Atacama: Caldera, Oct. 1894, *Gigoux 10* (G). Coquimbo: Rivadavia, 900 m., Sept. 17, 1936, *Montero 2849* (G); rare on dry hills along road between La Serena and Arqueros, Oct. 1833, *Gay 141* (Paris, type of *A. filifolius*); prov. Coquimbo, *Gay* as *A. filifolius* (G); Loma Fray Jorge, 1917, *Skottsberg 1467* (Stock). Aconcagua: Las Palmas de Pedegua, 1300 m. alt., Sept. 1933, *Grandjot* (Grandjot); indefinite [Hac. Catemu], *ex Philippi* as *P. concinna* (BD, Stock); Valparaiso, *Cuming 736* (K). Santiago: Colina, 1825, *Macrae* (K); Baños de Colina, *Bridges* (K); Curacavi, Oct. 1898, *Castillo 14* (G). Colchagua: near Rio Cachapoal, Sept. 1928, *Bertero 65* (NY, Del); along Rio Cachapoal near San Joaquin, Oct. 1829, *Bertero 65* (Paris, type of *A. alberjilla*); indefinite, *Bertero* as *A. Berteri* (BD); Rancagua, *ex Philippi, no. 212*, as *A. amatus* (BD); Baños de Cauquenes, 1867, *Philippi* as *A. cauquenensis* (BD); Cauquenes, Oct. 1922, *Claude Joseph 1824* (US). Talca: Talca, Oct. 1921, *Claude Joseph 1670* (US). Nuble: Cordillera Chillan, Dec. 1855, *Germain* (Santiago, ? type of *P. elongata*); General Cruz, arenales del Itata, 101 m. alt., 1934, *Montero 1925* (G). Concepcion: Tome, Nov. 1925, *Claude Joseph 4035* (US); Concepcion, *Beechey Voy.* (K, type of *A. prostratus*); Concepcion, *Reed* (K); San Miguel, Nov. 1933, *Barros 124* (G); slopes of Cerro Caracol, Concepcion, 1895, *Brenning* (BD); prostrate on summit of Cerro Caracol, 1903, *Scott Elliot 115* (BM); near falls of Rio Laja, 200 m. alt., open pasture land, *West 5093* (Univ. Calif.). Indefinite: "Chile," *Gay* (Paris, type of *A. gratus*); Loncoche, Sept. 1926, *Claude Joseph 4320* (US).

As here treated *A. Berteri* is almost certainly an aggregate of several species or good geographical varieties. The specimens available to me have been not only too few in number but also too deficient in fruiting structures for me to propose a segregation of this complex.

The type of *A. Berteri* was collected by Bertero on Cerro de la Leon near the Rio Cachapoal in 1830, and is no doubt similar to other collections at this locality made in 1828 and 1829 and distributed under his number 65. This number, however, is an aggregate consisting of *A. orthocarpus* and two forms of *A. Berteri*, one of the latter with strigose, the other with glabrous ovary. Colla describes the fruit as "glabriuscula," rather than glaberrima, and we may assume he had the fruiting plant from Bertero, found most widely in herbaria under Bertero 65, in which, though the fruit appears to be glabrous, it is actually sparsely strigose when viewed under a lens. Colla described the fruit as triquetrous, but his illustration and Bertero's specimens show the lower suture to be distinctly inflexed and the lateral faces of the pod plane and almost parallel. The herbage is silky strigose. This typical form of the species, ranging along the base of the cordilleras, appears to have synonyms in *P. grata*, *A. alberjilla*, *P. concinna*, *P. cauquenensis* and *A. elongatus*.

Growing in the coastal area, from Concepcion to Coquimbo and Atacama, is another form of this aggregate. This is usually glabrescent. It has well developed very slender stems bearing elongate peduncles frequently twice as long as the subtending leaf. The leaflets are usually

very slender. In southern plants they may become emarginate at the apex. The following names apply to this coastal form: *A. prostratus*, *A. filifolius*, and *A. pencanus*.

These two principal forms, that along the coast and that in the drier interior, vary much in the form, color, proportions and size of the corolla-parts. I suspect that a thorough study of the corollas will aid in delimiting segregates from this complex. I have made a prolonged attempt to find characters which would sharply separate the coastal and interior plants and so reduce some of the obvious complexity of the species. My inability to achieve this I am now convinced is due to the fact that not two but probably four or five species or varieties are involved. However, the following attempt to contrast the coastal and interior forms may be of interest:

Plant erect or the short stems decumbent only at the base, cinereous to canescent with abundant appressed hairs; pods usually deltoid in cross-section, broadly inflexed below; montaine.....*A. Berteri typicus*

Plant loosely decumbent with slender elongate spreading stems, green or cinereous with sparse appressed hairs or subglabrous; pods laterally much compressed, narrowly sagittate in cross-section, deeply and narrowly intruded below; coastal.....“A. filifolius”

46. **Astragalus Germaini** Philippi, Linnaea 28: 621 (1857); Reiche, Anal. Univ. Chile 97: 547 (1897), and Fl. Chile 2: 90 (1898). — Type from Las Arañas, Cord. Santiago, ***Philippi***.

Astragalus Segethi Philippi, Linnaea 33: 47 (1864). — Type from Las Arañas, Cord. Santiago, ***Philippi***.

Astragalus dilectus Philippi, Anal. Univ. Chile 41: 690 (1872). — Type from Andes de Talcarehue, prov. Colchagua.

Astragalus Closianus Philippi, Anal. Univ. Chile 41: 691 (1872). — Type from near Baños de Cauquenes, prov. Colchagua, Oct. 1867, ***Philippi***.

Astragalus Dessaueri Philippi, Anal. Univ. Chile 84: 26 (1893). — Type from Cerro de las Viscachas, Est. Cauquene, prov. Colchagua, ***de Dessauer***.

Astragalus alfalfalis Philippi, Anal. Univ. Chile 84: 29 (1893). — Type from Valle del Rio Colorado, prov. Santiago, 1700 m. alt., Jan. 1888, ***Philippi***.

Astragalus azureus Philippi ex Reiche, Anal. Univ. Chile 97: 548 (1897), and Fl. Chile 2: 91 (1898). — Type from the cordillera de Curico.

Astragalus Germaini var. *azureus* Philippi ex Fries, Nova Acta R. Soc. Sci Upsala ser. IV, 1[1]: 135 (1905).

RANGE: Cordilleras of Santiago, Colchagua and Curico.

CHILE. Santiago: Cord. de Santiago, ***ex Philippi*** as *A. Germaini* (BD); mountains east of Santiago, 900 m. alt., Nov. 23, 1900, *Hastings 191* (US); Quelte-hues, 1700 m. alt., 1927, *Montero 324* (K); Queb. del Manzano, Valle del Maipo, Nov. 4, 1930, *Pirion 1242* and *1243* (G); El Manzano, Nov. 1937, *Espinosa 17* (G); Divisadero de Lagunillos near San Jose de Maipo, 1936, *Looser 3612* (G). Col-chagua: Valle del Clarillo, 1200 m. alt., Nov. 1933, *Grandjot* (Grandjot).

A species evidently related to *A. Berteri* but readily distinguished by its firm glabrous triquetrous fruit, its usually obtuse or retuse leaflets, and its montane distribution. In having a triquetrous fruit with a broad flat lower face *A. Germaini* is similar to *A. carinatus* of the eastern slopes of the Andes.

47. **Astragalus Garbancillo**, Cavanilles, Icon. et Descr. Pl. 1: 59, t. 85 (1791). — Based upon collections from the puna near Tarma and from the prov. Huarochiri, Peru, and upon material cultivated at Madrid.

Astragalus unifultus L'Heritier, Stirp. Nov. 6: 168 (1791–92). — Type from Peru, *Dombey*.

Astragalus Benthamianus Gillies ex Hooker & Arnott, Bot. Misc. 3: 187 (1832). — Type from El Alto de las Manantiales, Mendoza, *Gillies*.

Astragalus minor Clos in Gay, Fl. Chile 2: 107 (1846). — Type given as from Arqueros, prov. Coquimbo, Chile, *Gay*, but probably from Peru.

Astragalus Mandoni Rusby, Mem. Torrey Bot. Club 3: 19 (1893). — Based upon Bolivian collections, Sorata, *Mandon 709* and Mt. Tunari, *Bang 1022*.

Astragalus Garbancillo var. *Mandoni* (Rusby) Macbride, Field Mus. Pub. Bot. 8: 100 (1930).

This is the most widely distributed and the most commonly collected species of South American *Astragalus*. It ranges at middle altitudes from central Peru southward to the Tucuman and Mendoza areas in Argentina. In central Peru it has been collected in the departments of Libertad, Ancash, Junin, Huanuco, Huancavalica and Lima at 2000 to 3500 m. altitude. In southern Peru it is known from the departments of Puna and Cuzco. In Bolivia it is best known and has been much collected about La Paz and Lake Titicaca. From there it ranges southward through eastern Oruro and southern Cochabamba and on through central and eastern Potosi, Camargo and Tarija into Argentina. Much of its range in Bolivia is hence in the Yungas. The plant evidently affects the more mesophytic and more dissected country east of the puna. Within Argentina it extends through Los Andes, Jujuy and Salta reaching to Tucuman (2000–3400 m. alt.), and further southward through Catamarca, La Rioja (Sierra Famatina) and San Juan (Leoncito, *Echegary;* Cord. Colamgüil, 3150 m. alt., *Perez Moreau 30/109*) to its southern limit in northern Mendoza (Portez. de los Chilcas, 2000 m. alt., *Semper 4261;* Alto de los Manantiales, *Gillies*). With the exception of one very questionable specimen, there is no record of the species in Chile. It reaches the Pacific Slope only in central Peru.

Within our area *A. Garbancillo* is very distinct and has no close relative. The difficulties in delimiting the species are confined to central Peru where it appears to have given rise to the evidently related *A. Pickeringii* Gray, *A. alienus* Gray and possibly also *A. romasanus* Ulbrich, cf. Johnston, Jour. Arnold Arb. 19: 92–95 (1938). Throughout its wide range *A. Garbancillo* is rather variable. Some of its variations seem to be vaguely correlated with geography, but none of them definitely enough to warrant any nomenclatorial recognition at the present time.

The type collection of *A. unifultus* is a plant with the stems pallid and strigose. It much resembles the common form found in the department of Junin. I suspect that it probably came from that section of central Peru. Judging from the original description and illustration of *A. Garbancillo*, it must be a very similar plant from the same region. Plants very similar to the type of *A. unifultus* are the common and usual form of the species in western Bolivia and Argentina.

The name *A. Garbancillo* Cav. appears to have six months or even a year priority over *A. unifultus* L'Herit. The former was published in volume one of Cavanilles' Icones, which is dated in the preface Jan. 1791, and was apparently issued the same year. This date has never been questioned. L'Heritier's species, however, appeared in the sixth fascicle of his Stirpes Novae, which, though bearing the title-page date 1785, was actually issued much later. Britten & Woodward, Jour. Bot. 43: 267–68 (1902), accept the date of the sixth fascicle as being doubtfully December 1891. A contemporary reviewer, Usteri, Neue Annalen der Botanik, pt. 2, p. 11 (1794), however, states that this fascicle "quanquam titulus annum editionis 1785 prae se ferat, non tamen nisi medio anno 1792 evulgatus est." Hence there seems good reason for accepting Cavanilles' binomial as the prior name.

The commonest form of *A. Garbancillo* in northern Bolivia and southern Peru is a rather slender more or less fruticulose plant with the stems and herbage green and rather sparsely strigose. One of the extremes of this form has been described as *A. Mandoni*. I have seen similar forms from various parts of the range of the species.

When it was published, *A. minor* was given as having been collected by Gay at Arqueros, a mining region at the base of the cordilleras northeast of Coquimbo, Chile. The type at Paris, however, is associated merely with a printed label indicating that the plant was collected by Gay in Chile. The single specimen is in flower. The stems are slender, erect and thinly strigose. The leaves are also sparsely strigose. The whole aspect of the plant is that of the forms of the species found in southern Peru, a region where Gay is known to have also collected. I believe that the type of *A. minor* is another example of the many cases of mixed and confused collections to be found among Gay's Chilean plants. I do not believe that the type was collected in Chile.

The type of *A. Benthamianus* is one of the two collections of *A. Garbancillo* which I have seen from Mendoza, at the southern limit of the species. The specimens are mature ones with ripe fruit and withered corollas. The coarse stems appear to have been white and strigose when young.

Besides the slender green form and the stouter white-strigose typical form of *A. Garbancillo* there is another variation that deserves some comment. The flowers of the species usually average about 15 mm. in length. In northern Argentina and southern Bolivia there are certain excessively vigorous luxuriant forms which produce flowers 20 mm. long or more. These plants may be green or white-strigose. Characteristic specimens of this vigorous plant have been seen from the mountains of Tucuman (*Lorentz & Hieronymus 694; Venturi 4661*), from the province of Jujuy (*Hofsten 754*) and from the department of Tarija (*Fiebrig 2469a*). This coarse, large-flowered plant may possibly merit a name.

The poisonous qualities of this species have long been known. Awschalom, Lab. Quimica Analitica, Univ. Tucuman, Pub. no. 1: 1–29 (1928), has studied the species and has identified the saponin.

48. **Astragalus arequipensis** Vogel, Verhandl. K. Leop.-Carol. Akad. Naturf. 19: suppl. 17 (1843). — Type from near Arequipa, 3000 m. alt., *Meyen*.

Astragalus Orbignyanus Weddell, Chlor. Andina 2: 260 (1861). — Type from the prov. Carangas, *d'Orbigny 1437*.

Astragalus drepanophorus Grisebach, Abh. K. Gess. Wiss. Göttingen 24: 102 (1879). — Type from La Cienega, Tucuman, 1874, *Hieronymus & Lorentz*.

Astragalus bolivianus Philippi, Cat. Pl. Itin. Tarapaca 15 (1891); Reiche, Anal. Univ. Chile 97: 539 (1897), and Fl. Chile 2: 82 (1898). — Described from collections from Quebrada de Calalaste, Miñique, and Sitani, 3500–3700 m. alt.

Astragalus sinocarpus Rusby, Mem. Torrey Bot. Club 3: 19 (1893). — Type from near La Paz, 1890, *Bang 174*.

RANGE: High mountains of northern Argentina northward over the Bolivian plateau to southern Peru.

PERU. Arequipa: Arequipa, *Meyen* (BD, type of *A. arequipensis*); near Arequipa 2000–2500 m. alt., 1923, *Guenther & Buchtien 1107*, *1109*, *1113* and *1115* (Hamb); between Arequipa and Puna Lagunillas, 4300 m. alt., 1934, *Hammarlund 73* (Stock); between Arequipa and Puna Sumbay, 4060 m. alt., 1933, *Hammarlund 79* (Stock). Puno: Chuquibambillo, 3950 m. alt., 1925, *Pennell 13351* (G, US, FM); Azangaro, June 1854, *Lechler 3243* (K); Occa Pampa, Huancané, 3250 m. alt., 1919, *Shepard 83* (G, US); Pucará, 1902, *Weberbauer 438A* (BD); Puno, *Martenet 575* (Paris); Juliaca, May 16, 1902, *Williams 2513* (US).

BOLIVIA. La Paz: Guarina, 1865, *Raimondi 10515* (BD); prov. Omasuyos, 3900 4000 m. alt., *Mandon 710* (G, K, BM, Del); near La Paz, 3000 m. alt., 1890, *Bang 174* (NY, type of *A. sinocarpus;* G, US, K, BM, BD); between Palca and La Paz, 4000 m. alt., 1910, *Pflanz 373* (BD); Valle de Chuquiaguillo east of La Paz, 3500–4000 m. alt., 1906, *Hauthal 224* (BD); Isla del Sol, Titicaca, 3840 m. alt., *Buchtien 2870* (US); Tiahuanaco, 1903, *Hill 120* (K); near Viacha, 3900 m. alt., 1907, *Buchtien 625* (US, BD); Paz de Azacucho, Corocoro, 1846, *Weddell 4338* (Paris). Oruro: Pazna, 4100 m. alt., 1908, *Buchtien 1812* (US, BD); Prov. Carangas, west of Oruro, *d'Orbigny 1437* (Paris, type of *A. Orbignyanus*). Potosi: Quechisla, prov. Nor Chichas, 3400 m. alt., 1932, *Cardenas 305* (US); Lagunillas, 3800 m. alt., 1933, *Cardenas 381* (US); Uyuni, Oct. 3, 1894, *Kuntze* (NY, US, BD); Chiguana, 3700 m. alt., 1921, *Asplund 6127* (US) and *3077* (Upsala). Chuquisaca: mountains between Pomabamba and Comargo, *Weddell 3981B* (Paris). Tarija: Calderillo, 3100 m. alt., Jan. 6, 1904, *Fiebrig 2469* in pt. (BD).

CHILE. Arica: Ancara, Cord. Volcan Tacora, ca. 4300 m. alt., April 1926, *Werdermann 1119* (G, K, BD).

ARGENTINA. Los Andes: Calalaste, Jan. 1885, *Philippi* (US, K, BD, isotypes of *A. bolivianus*); Mina Concordia, Feb. 26, 1927, *Castellanos 28/824* (G). Jujuy: puna near Yavi, May 1873, *Lorentz & Hieronymus 702* (BD); Moreno, 3500 m. alt., 1901, *Fries 759* (Stock). Salta: Cerro de Cachi, 3500–4000 m. alt., *Venturi 6700* and *6706* (US); Cuesta de Arca to Trancas, Jan. 1897, *Spegazzini* (LP). Catamarca: Yutuyaco, dept. Andalgalá, *Jorgensen 1629* (G); Chucula, Feb. 2, 1930, *Castellanos 30 520* (G). Tucuman: La Cienega, 1874, *Hieronymus & Lorentz 663* (US, FM, BD, isotype of *A. drepanophorus*) and *693* (FM, K, BD); La Cienega, dept. Tafi, 2800 m. alt., 1933, *Burkart 5390* (G); La Queñua, dept. Tafi, 3000 m. alt., Jan. 1930, *Parodi 10769* (G) and *Burkart 5389* (G); Lara, Jan. 1912, *Rodriguez 261* (G); Est. Las Pavas, dept. Chicligasta, 3500 m. alt., *Venturi 4710* (G, US). La Rioja: Corral Colorado, Sierra Famatina, Feb. 12, 1879, *Hieronymus & Niederlein* (BD). San Juan: Las Cabeceras de Leoncito, Jan. 1876, *Echegaray* (BD).

The leaves of this species are large and coarse and much surpass the inflorescence. The flowers are small, congested and short-pedunculate. The stems have short internodes and are usually less than a decimeter long, and usually spreading. The calyx is black hairy. The triquetrous

fruit is characteristically lunate in outline and inside has a well developed membranous false septum. The synonyms I have listed all evidently belong to trivial phases of this readily recognized species. The species has only two close relatives, *A. Brackenridgei* Gray (cf. Johnston, Jour. Arnold Arb. 19: 95. 1938) of central Peru and *A. cryptanthus* Wedd. of the Bolivian Plateau. It is quite possible that the former is only a geographical variant and that the latter is only a freak glabrescent form of the present species.

49. **Astragalus cryptanthus** Weddell, Chlor. Andina 2: 258 (1861). — Type from la quebrada de las Lagunas de Potosi, *d'Orbigny 1435*.

BOLIVIA. Potosi: near snow line, Queb. de las Lagunas de Potosi, *d'Orbigny 1435* (Paris, type). La Paz: La Paz, Aug. 24, 1901, *Williams 2351* (US, NY).
CHILE. Arica: Chislluma, Cord. de Volcan Tacora, ca. 4500 m. alt., *Werdermann 1159* (G, K, BD).

This peculiar plant is evidently related to *A. arequipensis* and may be only a very peculiar form of it. It is apparently rare for I have seen only three different collections, all remarkably similar though from widely separated stations, and all from within the range of *A. arequipensis*. The plants are distinguished from *A. arequipensis* by their bright green color and very sparse indument. The stems also tend to be more elongate and the small leaves somewhat more succulent. The fruit is glabrous and may be lunate or may be short and oblong as in the related *A. Brackenridgei* of central Peru.

50. **Astragalus Sanctae-Crucis** Spegazzini, Rev. Fac. Agron. y Vet. La Plata 3: 505 (1897). — Type from Monte Leon near the Rio Santa Cruz, Patagonia, *Spegazzini*.

RANGE: Along the coast of Patagonia in sands and gravel.

ARGENTINA. Santa Cruz: Minerales, 200 m. alt., Oct. 28 and Nov. 20, 1929, *Donat 196* (G, NY, K); Monte Leon near Santa Cruz, in gravel, 1882, *Spegazzini* (type, La Plata). Chubut: campo near Cabo Raso, *Fischer* (LP). Rio Negro: Viedma, medanos del Faro, Nov. 14, 1928, *Castellanos 28/1139* (G). Buenos Aires: Necochea, dunes, Jan. 4, 1930, *Cabrera 1303* (G); Punta Negra, 15 km. s. of Necochea, shifting sand near seashore, corolla blue, base of petals white, Dec. 12, 1938, *Eyerdam, Beetle & Grondona 23728* (G).

Without any close affinities in South America, this plant probably has its closest relatives in the group of *A. Nuttallianus* of North America. It is prostrate and has very elongate straight subcylindrical strict pods. The false septum is well developed and nearly divides the fruit into two cells.

51. **Astragalus orthocarpus**, nom. nov.

Phaca oligantha Philippi, Linnaea 33: 42 (1864). — Type from the base of the cordillera in the prov. Colchagua, Chile.
Astragalus oliganthus (Phil.) Reiche, Anal. Univ. Chile 97: 567 (1897), and Fl. Chile 2: 110 (1898). Not Kar. & Kir. (1842).

RANGE: Known only from the province of Colchagua, Chile, at the base of the cordilleras.

CHILE. Colchagua: Monte de la Leon, *Bertero 65* (BM, Boiss, Paris); without locality, *Bridges* (G, K, BM, BD) and *ex Philippi* as *P. oligantha* (BD, Del, Boiss, Stock); Centinela, 400 m. alt., 1928, *Montero 1382* (G).

A species readily confused with *A. Berteri* and perhaps most closely related to it. It may be distinguished from *A. Berteri* by its erect or ascending, short and stout, rather plump legumes. In habit the plant seems to be more slender than its relative, having elongate leafy prostrate or decumbent stems and apparently slightly smaller flowers. The fruit has convex valves which become tough and hard. The lower suture is situated in a broad shallow depression. Flowering plants of *A. orthocarpus* and *A. Berteri* are distinguished with difficulty. Among the species listed as synonyms of *A. Berteri* there are several founded on flowering plants which conceivably may be proved to belong to the present plant and so provide it with an older name.

52. **Astragalus Domeykoanus** (Phil.) Reiche, Anal. Univ. Chile 97: 550 (1897), and Fl. Chile 2: 93 (1898).

Phaca Domeykoana Philippi, Anal. Univ. Chile 84: 18 1893). — Type from Turrieta, prov. Talca, lat. 35° 30′ S., Feb. 1879, *F. Philippi*.

Phaca orites Philippi, Anal. Univ. Chile 84: 24 (1893). — Type from Gualletué, cord. prov. Cautin, Feb. 1887, *Rahmer*.

Astragalus orites (Phil.) Reiche, Anal. Univ. Chile 97: 551 (1897), and Fl. Chile 2: 94 (1898).

Tragacantha procumbens var. *glabrescens* Kuntze, Rev. Gen. 3: 73 (1898). — Based upon specimen from "Patagonia," *Moreno & Tonini 727*.

RANGE: Along the cordilleras from Talca and Neuquen southward to southern Patagonia.

CHILE. Talca: Turrieta, Cordilleras east of Talca, Feb. 1897, *F. Philippi* (LP, isotype of *A. Domeykoanus*). Maule: Cord. de Maule, *Germain* (K, BM); Andes de Antuco, 2400 m. alt., 1828, *Poeppig* (Munich); Cord. de Linares, *ex Philippi 215* (BD). Cautin: Araucania, *ex Philippi* as *P. araucanus* (K, BD; ?isotypes of *P. orites*).

ARGENTINA. Neuquen: Pino Hachado, 1920, *Parodi 2284* (Parodi); Cajon de Pino Hachado, Sept. 1900, *Spegazzini* (LP); Cerro Colohuincul, moist sandy hillside, 1500–1800 m. alt., Dec. 17, 1926, *Comber 878* (K); Polcahue, 1200 m. alt. Jan. 16, 1926, *Comber 458* (K); Valle Escondida, iron-bog in valley, 1800 m. alt., *Comber 279* (K); Lagunas Lui Cullin, *Comber 1169* (K); Sierra Mamuil Malal, 1800 m. alt., Jan. 3, 1927, *Comber 926* (K). Rio Negro: Bariloche, Cerro Gutierrez, 1500 m. alt., Feb. 28, 1905, *Buchtien 23* (US, K). Chubut: mountains near Carren-leofu, 1901, *Illin* (LP); Valle de la Laguna Blanca, Dec. 20, 1901, *Koslowsky 187* (K); Valle de la Lago Blanco, Dec. 1903, *no collector given* (LP). Santa Cruz: near Lago Argentino, 1000 m. alt., Jan. 30, 1905, *Dusen 5765* (Stock), Lago Posadas, 800 m. alt., Dec. 20, 1908, *Skottsberg 760* (Stock). Indefinite: Patagonia, *Moreno & Tonini 727* (NY, type of var. *glabrescens*).

This species is very closely related to the poorly understood *A. complicatus* of the andes of Mendoza. It may be no more than a variety of that species with sparsely and inconspicuously strigose or glabrous leaflets. It has obcordate or retuse obovate-oblong leaflets that are normally folded along the midrib. In texture they are rather thick and fleshy. The fruit is apparently rather variable. Most specimens have sparsely black-strigose pods about 8 mm. long which are either distinctly triangular in cross-section or are more or less compressed. They have a distinctly intruded lower suture. In some specimens the pods are not only larger (10–14 mm. long) and of more fragile texture, but are also less angular

and more or less inflated. The fruit is then broadly lenticular in cross-section with the lower margin only weakly flattened. I am unable to correlate these surprising variations in fruit with any other structural variations of the plant or with geography.

The type-collection of *A. Domeykoanus* is in the flowering condition and has no fruit. It is very similar to other collections from the cordilleras of south-central Chile which have short angulate pods that are contracted apically into a short beak. These plants are all low and spreading and come from near the continental divide.

The type of *P. orites* comes from the headwaters of the Rio Bio Bio. The fruit is of the short angulate type. The leaflets though rather large are characteristically glabrous, deeply notched and evidently folded as in true *A. Domeykoanus*, but the stems are about 2 dm. long and appear to be erect. These differences in leaf-size and growth-habit may well be ecological.

The type sheet of *T. procumbens* var. *glabrescens*, labeled merely as from Patagonia, is a mixture of *A. Domeykoanus* and *A. Cruckshanksii*. The specimen of the former is practically glabrous; that of the latter is evidently strigose. Since the material of *A. Domeykoanus* is more appropriately covered by the epithet "*glabrescens*," I am of the opinion that Kuntze's variety had best be treated as a synonym of the present species.

53. **Astragalus complicatus** Gillies ex Hooker & Arnott, Bot. Misc. 3: 187 (1832). — Type from El Cerro de la Polcura, *Gillies*.

RANGE: Known only from the type locality.

ARGENTINA. Mendoza: El Cerro de la Polcura, andes of Mendoza, *Gillies*, (K, type).

This species is known only from a single collection made over a hundred years ago. It is evidently related to *A. Domeykoanus*, which ranges widely along the Andes further south. It differs from the southern plants only in its distinctly strigose foliage. The type came from a locality 200 to 300 km. north of the most northern known station of its relative. The relationship between the two species is so clear that I shall not be surprised if new collections from Mendoza prove that the species cannot be separated by the characters given. The name *A. complicatus*, being the oldest, must then be applied to the larger specific concept.

54. **Astragalus punae**, sp. nov.

Planta cinerea; caulibus pluribus decumbentibus 6–8 cm. longis simplicibus vel basim versus longi-ramosis sparse plus minusve adpresse villosis ca. 1.5 mm. crassis; foliis pilis 0.5–1 mm. longis sinuatis leviter adpressis griseo-vestitis; rhachibus 3–5 cm. longis infra medium nudis; foliolis 9–11-jugatis plicatis, 4–7 mm. longis ca. 2 mm. latis oblongis vel oblongo-ellipticis supra plus minusve glabris subtus villosis apice obtusis vel truncatis saepe emarginatis; stipulis 4–5 mm. longis membranaceis sparse strigosis; racemis 5–10-floris capitato-congestis 0.7–1 cm. diametro saepe in axillis foliorum superiorum subsessilibus (0–5 mm. longe pedunculatis); bracteis lanceolatis 3–4 mm. longis; calycibus sessilibus 3–4 mm. longis

subtomentosis, lobis linearibus 1–1.5 mm. longis; vexillo 6 mm. longo, lamina 2.5 mm. lata apice emarginata; alis 5 mm. longis quam carina 1.5 mm. longioribus; leguminibus ascendentibus 4–5 mm. longis 2 mm. crassis 2–2.5 mm. altis dense albiterque villosis 4-seminatis unilocularibus, intus septum membranaceum haud gerentibus, a latere viso margine superiore rectis et margine inferiore convexis, apice acutis, basi rotundis, sutura inferiore evidenter 0.7–1 mm. profundeque introflexa.

ARGENTINA. Puna de Atacama, "Garbancillo de la Puna," *herb. Spegazzini*, no. *2111*, sub "*A. bolivianus*?" (La Plata, type).

For this very distinct species, which I know only from the type, I can suggest no close relative. In habit it somewhat suggests a slender villous form of *A. arequipensis*, but it is certainly not a close relative of that species. It also suggests some of the coarse forms of *A. micranthellus* and possibly may be closely related to that species. The subsessile dense axillary clusters of flowers, the villous indument, and the small ovoid villous pods are outstanding characters of *A. punae*. The fruit is not tough in texture. It completely lacks a false septum.

55. **Astragalus micranthellus** Weddell, Chlor. Andina 2: 262 (1861). — Original collections from near Puno, Peru, *Weddell 4503*, and from near La Laguna de Potosi, *d'Orbigny 1436*.

Astragalus capitellus Britton, Bull. Torrey Bot. Club 16: 260 (1889). — Type from near La Paz, *Rusby 1005*.

Tragacantha arequibensis var. *minima* Kuntze, Rev. Gen. 3: 73 (1898). — Type from between Uyuni and Machacamarca, Bolivia, *Kuntze*.

Tragacantha arequibensis var. *tenuifoliola* Kuntze, Rev. Gen. 3: 73 (1898). — Type from near Tiraque, *Kuntze*.

Astragalus patancanus Ulbrich, Bot. Jahrb. 37: 417 (1906). — Type from Puna Patanca, Tarija, *Fiebrig 2612*.

RANGE: High altitudes, on punas, from southernmost Peru, across Bolivia, to northern Argentina.

PERU. Puno: near Juliaca, 1903, *Hill 127* and *128* (K); near Puno, *Weddell 4503* (Paris, type of *A. micranthellus*). Arequipa: near Arequipa, 2000–2500 m. alt., 1923, *Guenther & Buchtien* (Hamb). Moquegua: Ubinas, March 1864, *Raimondi 11725* (BD).

BOLIVIA. La Paz: La Paz, 3000–4100 m. alt., *Buchtien 2872* (US), *Buchtien 626* (US, BD) and *Rusby 1005* (NY, type of *A. capitellus*); Potopoto near La Paz, 3790 m. alt., 1861, *Mandon* (K, BM, Del, Stock); Guaqui plateau, 3750 m. alt., 1903, *Hill 125* (K); Viacha, 3900 m. alt., Jan. 29, 1921, *Asplund 2110* and *2122* (Upsala); Guaqui, 3900 m. alt., Jan. 31, 1921, *Asplund 2221* (Upsala); Corocoro, 4000 m. alt., Feb. 15, 1921, *Asplund 2440* (Upsala); Ulloma, 3800 m. alt., Feb. 21, 1921, *Asplund 2554* (Upsala); Charaña, 4050 m. alt., March 1, 1921, *Asplund 2670* (Upsala); between San Pablo and Achacachi, 1903, *Hill 129* (K). Oruro: Hacienda Huanca roma near Eucaliptus, prov. Cercado, 3800 m. alt., 1934, *Hammarlund 111* (NY, Stock); Challapata, 3800 m. alt., March 31, 1921, *Asplund 3282* (Upsala). Cochabamba: Tiraque, Sierra de Santa Cruz, 3000 m. alt., April 1–4, 1892, *Kuntze* (NY, type of var. *tenuifolia*). Potosi: near La Laguna de Potosi, *d'Orbigny 1436* (Paris, cotype of *A. micranthellus*); Potosi, 4000 m. alt., 1933, *Cardenas 366* (US); Quechisla, prov. Nor Chicas, 1931, *Cardenas 82* (G); puna between Uyuni and Machacamarca, March 11, 1892, *Kuntze* (NY, type of var. *minima*); Uyuni, 3700 m. alt., March 25, 1921, *Asplund 6144* (US) and *3149* (Upsala); Atocha, 3700 m. alt., March 20, 1921, *Asplund 2999* (Upsala). Sucre: Muyaquiri, prov. Cinti, 1934, *Hammarlund 386* (Stock). Tarija: Escayadu, 3500 m. alt., 1904, *Fiebrig 3498E*

(BD); Puna Patanca, 3700 m. alt., 1904, *Fiebrig 2612* (BD, type of *A. patancanus*; G, K, Paris).

ARGENTINA. Jujuy: Cerro de Chani, 4000 m. alt., 1929, *Venturi 8526* (US); Moreno, 3500 m. alt., *Fries 809* (Stock); north of Tres Cruces, 1921, *Castellanos 53* (G); Santa Catalina, 3650–4100 m. alt., 1901, *Claren 11465* in pt., *11476*, *11419* and *11499* in pt. (Stock). Salta: Cerro de Cachi, 4000–4500 m. alt., 1927, *Venturi 6681* and *6694* (US). Catamarca: Cerro Negro, dept. Andalgalá, 3500 m. alt., *Joergensen 1628* (G, US), *1629* (G). Tucuman: Lara, Trancas, 1912, *Rodriguez 339* (G).

The plants associated here are slender stemmed, depressed, and prostrate or spreading. The small flowers are clustered on peduncles shorter than the subtending leaf. The pods are 5–13 mm. long, sparsely strigose and laterally compressed. The valves of the fruit are flattened and usually about 3 mm. broad. The lower suture is strongly intruded. Under favorable conditions the widely spreading stems may become 1–2 dm. long and loosely branched. Most plants, however, have prostrate stems only 5–10 cm. long. Some of the plants from extreme environments at high altitudes become very reduced and compacted, becoming somewhat caespitose or somewhat pulvinate (e.g. *Venturi 6694*).

Most of the collections treated as *A. atacamensis* by Fries, Nova Acta R. Soc. Sci. Upsala IV, 1[1]: 134 (1905), actually belong to *A. micranthellus*. Among the collections cited by Fries, *A. micranthellus* appears in several mixtures; with *A. Bustillosii* (no. 11465), with *A. minimus* (no. 916) and *A. crymophilus* (no. 11499 sub "*A. modestus*"). Hosseus, Bol. Acad. Nac. Cordoba 26: 157 (1921) has noted some of these mixtures and misidentifications.

56. **Astragalus triflorus** (DC.) Gray, Plant. Wright. 2: 45 (1853), as to name-bringing synonym only.

Phaca triflora DeCandolle, Astrag. 62, t. 1 (1802). — Type given as collected in Peru by Dombey.

Astragalus viciiformis Ulbrich, Bot. Jahrb. 37: 550 (1906). — Type from near Mollendo, *Weberbauer 1504*.

RANGE: Coastal hills, in the Loma Formation, from central Peru to northern Chile.

PERU. Lima: Cerro San Augustin, 300–400 m. alt., 1909, *Weberbauer 5241* (BD); Tablada de Lurin, *Mathews 1005* (K, BM). Arequipa: Lomas de Capac, near Chala, Oct. 1863, *Raimondi 11648* (BD); Loma del Toro, near Atico, Nov. 1863, *Raimondi 11593* (BD); Mollendo, sandy flat at lower edge of the fertile belt, 1902, *Weberbauer 1504* (BD, type of *A. viciiformis*); Mollendo, *Johnston 3569* (G, K) and *Hitchcock 22364* (US); Mejia, 30–40 m. alt., 1923, *Guenther & Buchtien 273* and *272B* (Hamb); Cachendo, 900–1000 m. alt., *Guenther & Buchtien 272B* and *274* (Hamb); Posco, 575 m. alt., 1923, *Guenther & Buchtien 272* (Hamb). Moquegua: Torata, 2200–2300 m. alt., *Weberbauer 7418* (US, K, BD). Indefinite: Peru, *Dombey* (Paris, type of *P. triflora*).

CHILE. Tarapaca: Iquique, *Werdermann 754* (G, K, BM, BD). Antofagasta: Tocopilla, *Johnston 3621* (G) and *Jaffuel 1008* (G); Antofagasta, *Jaffuel 1146* (G).

This very distinct species, a small slender annual of the coastal hills of Peru and northern Chile, was one of the very first members of its genus to have been described from South America. Though the original

plate and description are accurate, the species has been discredited and misunderstood and its name consistently misapplied. DeCandolle based his *P. triflora* upon specimens collected by Dombey in Peru, probably near Lima. The original plate is a careful drawing of a specimen now preserved at Paris! The species is unquestionably the same as that described over a hundred years later as *A. viciiformis* Ulbr!

Much of the confusion enveloping our plant for over a century may be traced back to Kunth, H. B. K. Nov. Gen. 6: 495 (1824). That botanist gave an excellent description and illustration of a plant which Humboldt & Bonpland had collected on the volcano of Jorullo in Mexico and published them under the newly proposed name, *Phaca Candolliana*. He associated that name with the following synonymy, "*Phaca triflora* Decand. Astrag. p. 62. t. 1 (auct. Mu. Paris). Persoon Synops. 2. p. 331." The Mexican plant is very different from the coastal annual of Peru and Chile. Kunth, however, seems to have thought them to be conspecific and various subsequent authors have inferred that the name he coined, *P. Candolliana*, was merely a substitute name for the "Inappropriate and misleading" *P. triflora* DC. Even DeCandolle so considered it, for in his Prodromus, 2: 273 (1825), he gives *P. Candolliana* HBK as a synonym of *P. triflora* DC. Most authors have agreed with Jones, Astrag. 105 (1923), that the names *P. Candolliana* and *P. triflora* were not only "intended to be the same" but were originally applied to conspecific plants as well. The prevailing opinion seems to have been that DeCandolle's description and plate were crude and poor (Jones calls them "fanciful") and that his material may have come, not from Peru, but rather from Mexico. This is, of course, thoroughly incorrect and not in accord with the facts. DeCandolle's plate is a good representation of his species, which, we now know, did come from Peru.

There are good reasons for considering that the name *P. Candolliana* HBK. was intended as a substitute for DeCandolle's binomial, *P. triflora*. Personally, however, I feel that Kunth's binomial can well be restricted to the Mexican plant he figured and described. This has been recently done by Rydberg, No. Amer. Fl. 24: 350 (1929).

The accepted name for our plant of Chile and Peru was published by Gray, l.c., as follows: "*A.* (*Phaca*) *triflorus*. *Phaca triflora*, DC. Astrag. t. 1 & Prodr. 2. 273. *P. Candolliana*, H. B. K. Nov. Gen. & Sp. 6. p. 495. t. 586." It is evident that Gray accepted *P. triflora* and *P. Candolliana* as conspecific and as applying to the Mexican species as well as to the Texan plant he had in hand. This, of course, was incorrect, but since his nomenclatorial transfer is clearly and expressly founded upon *Phaca triflora* DC, even though he misunderstood DeCandolle's concept, the resulting combination, *Astragalus triflorus* (DC.) Gray must apply to our plant of Chile and Peru. Some authors, however, have insisted that the binomial *A. triflorus* must be applied to the plant of Texas which Gray was discussing when he made the combination, but this is clearly counter to the rules of nomenclature. This confusion of "species-

concept" and "nomenclature" reached its extreme with Sheldon, Minnesota Bot. Studies 1: 140 (1894), who cited "*A. triflorus* A. Gray. Pl. Wr. 2: 45. 1853. excl. syn." as a synonym of *A. Candollianus* (HBK.) Sheldon and proposed the combination "*A. triflorus* (DC.) Sheldon" for our *Phaca triflora* DC. of South America. The two most recent monographers have agreed in treating *A. triflorus* Gray as based upon *Phaca triflora* DC. Jones, Astrag. 105 (1923) considered it to be a species of both North and South America, while Rydberg, No. Amer. Fl. 24: 350 (1929), treated it as exclusively South American.

57. **Astragalus Famatinae**, sp. nov.

Planta perennis plus minusve argenteo-strigosa; caulibus gracilibus rigidiusculis prostratis 5–18 cm. longis 0.5–1 mm. crassis foliosis (internodiis 0.5–5 cm. longis) e caudice multicepitali radice valida profunda coronato erumpentibus; rhachi folii 5–20 mm. longa supra medium vel usque ad basim foliolata supra canaliculata; foliolis 4–5-jugatis 2–9 mm. longis 1–2 mm. latis ellipticis vel anguste oblongis plus minusve plicatis margine saepe paulo involutis apice rotundis vel obtusis rariter emarginatis subtus strigosis supra plus minusve glabris; stipulis 2–3 mm. longis strigosis ocreatis; racemis axillaribus densifloris 8–12 mm. diametro; pedunculo 1–3 cm. longo folio suffulciente saepe evidenter longiore; floribus saepe 10–15 capitato-congestis; calycibus 2–3 mm. longis, lobis 0.5–1 mm. longis pilis nigris et albis strigosis; pedicellis 0.5–1.5 mm. longis; bracteis 0.5–1 mm. longis oblongis; vexillo corollae 5–7 mm. longo, lamina 3–4 mm. lata; alis 4.5–6.5 mm. longis quam carina 2 mm. longioribus; ovario strigoso; leguminibus oblongis compressis vel prismaticis ca. 1 cm. longis 3–3.5 mm. altis 2–3 mm. crassis sparsissime strigosis 8–10 seminatis, a latere viso utrinque marginibus convexis, sutura inferiore late vel anguste introflexis, intus septum membranaceum ca. 0.5 mm. altum gerentibus.

ARGENTINA. La Rioja: La Incrucijada, Sierra Famatina, 1879, *Hieronymus & Niederlein 482* (type, Berlin); Los Berros, Sierra Famatina, 1879, *Hieronymus & Niederlein 586* (BD). San Juan: Quebrada del Salto, Cord. de Colangüil, Jan. 15, 1930, *Perez Moreau 30/98* (G).

Although with a gross aspect more suggestive of *A. micranthellus*, this well marked species seems to be much more closely related to the habitally dissimilar *A. tarijensis*. The fruit has a somewhat tough texture and seems to be more or less prismatic with the lower face flattened or shallowly and broadly introflexed. Some of the fruit on the type has the lower suture strongly and deeply intruded, but this may be the result of lateral pressure on the fruit when the specimens were pressed. There is a narrow but evident membranous false septum inside the fruit. The fruit of *A. Famatinae*, hence, has a different form (prismatic and oblong) and a firmer texture, as well as a false septum, which distinguishes it from the fruit of *A. micranthellus*. The plant is furthermore clothed with a coarser and somewhat silvery strigosity and hence differs from *A. micranthellus* in indument. The thicker, densely strigose leaflets with entire or only obscurely emarginate apices, and the firmer texture of the pods, readily distinguish *A. Famatinae* from all forms of *A. tarijensis*.

The type of the species has been cited by Hosseus, Bol. Acad. Nac. Cordoba 36: 152 (1921), as *A. modestus*. This is certainly incorrect. Hosseus has cited another specimen (no. 535) collected by Hieronymus & Niederlein in the Sierra Famatina. This latter, only a young specimen at anthesis, I examined as a duplicate in Berlin. In my notes this is assigned to "*A. micranthellus*," but now for various reasons I would wish to re-examine the collection before accepting that identification.

The material cited from San Juan is questionably referred to *A. Famatinae*. It represents a plant evidently related to that of the Sierra Famatina but has stems only 0.5–1 cm. long and has much contracted internodes. The leaves are consequently somewhat tufted and the inflorescence almost scapose. I believe it is a reduced plant conspecific with those from La Rioja. The material of it, however, is very fragmentary and its present disposition must be considered tentative.

58. **Astragalus tarijensis** Weddell, Chlor. Andina 2: 262 (1861). — Type from between Puna Iscaiachi and Valle de Tarija, Bolivia, *Weddell 4021*.

Astragalus Hieronymi Ulbrich, Bot. Jahrb. 37: 418 (1906). — Based upon collections from Cienega, Tucuman, *Lorentz & Hieronymus 580* and Calderillo, Tarija, *Fiebrig 2882*.

RANGE: Mountains of northwestern Argentina and adjacent Bolivia, mostly above 3000 m. altitude.

BOLIVIA. Tarija: Calderillo, 3400 m. alt., 1904, *Fiebrig 2882* (FM, BD, cotype of *A. Hieronymi*); along the descent from Puna de Iscaiachi into Valle de Tarija, 2500–3000 m. alt., Jan. 29–31, 1846, *Weddell 4021* (type of *A. tarijensis*, Paris).

ARGENTINA. Jujuy: Tilcara, 3000–3200 m. alt., *Venturi 6698* and *7421* (US); Cerro La Soledad, 3500 m. alt., 1928, *Venturi 9029* (G, US). Salta: between Cuesta del Arca and Trancas, Dec. 1896, *Spegazzini* (LP); Pampa Grande, Jan. 1897, *Spegazzini* (LP); La Laguna, Sierra del Cajon, 3900 m. alt., Jan. 1914, *Rodriguez 1317* (G). Catamarca: Cerro Negro, Feb. 9, 1916, *Joergensen 1887* (G, US); C. de Aconquija, 3800 m. alt., March 15, 1917, *Joergensen 1337* (US); Cerro del Campo Grande, Jan. 1874, *Schickendantz 256* (BD); Granadillas, Nov. 1877, *Schickendantz 88* (BD); Laguna del Tesoro, 4600 m. alt., 1925, *Venturi 6629* (US); Sierra de Anconquija, 4400 m. alt., 1926, *Venturi 6623* (US). Tucuman: Lara, Trancas, Jan. 27, 1912, *Rodriguez 280* (G); Cumbres Calchaquies, Tafi, 4000–4400 m. alt., *Burkart 5402* and *5387* (G) and *Parodi 10846* (G); La Queñua, 3000 m. alt., *Burkart 5397* (G); La Puerta, 4000 m. alt., *Burkart 5395*, *5396* and *5388* (G); Peñas Azules, 3400–3500 m. alt., *Burkart 5398* (G) and *Parodi 10911* (G); Cerro de San Jose, 2700 m. alt., *Venturi 3644* (G, US, LP); La Cienega, *Lorentz & Hieronymus 580* (K, BD, type of *A. Hieronymi*); Estan. Las Pavas, Chicligasta, 3000 m. alt., *Venturi 4681* and *6622* (US); Estan. Santa Rosas, 3800–4400 m. alt., *Venturi 3183* (G, US), *4007* (US) and *4749* (G, US, LP). La Rioja: Estacion 6, Camino a La Mejicana, Sierra Famatina, 3300 m. alt., Feb. 1927, *Parodi 7954* (G).

The types of *A. tarijensis* and *A. Hieronymi* are very similar in aspect and details. They are evidently conspecific and representative of the most common form of this very variable species. This common form has slender well developed ascending stems, green folded narrowly obcordate leaflets, black-strigose calyces, lanceolate bracts and strigose ovary. There are, unfortunately, frequent departures from this distinctive typical form. At very high altitudes the leafy stems become very short and the plant matted. The apex of the leaflets, usually broadly retuse, may

become rounded and only weakly emarginate, or even entire and actually acute. In outline the leaflets are commonly obcordate or oblong-obcordate. Some plants, evidently forms of *A. tarijensis*, have distinctly oblong, elliptic or even lanceolate leaflets. Most forms of the species have practically glabrous herbage of a characteristic dark green color. But I am also forced to admit in the species some plants having the herbage somewhat cinereous with evident scattered appressed hairs. When the common form of the species varies in only one of the details mentioned, its affinities are not obscured. When, however, several of these aberrant tendencies are exhibited in one plant its general appearance becomes very changed and quite different from that of the typical form. After a consideration of these puzzling forms I have finally been forced to place them under *A. tarijensis* as chance combinations of aberrant characters. They occur within the range of the normal form of the species and are usually represented by single collections. A study of a large series of *A. tarijensis* makes it clear that they are merely variants of this unstable species.

59. **Astragalus Weddellianus** (Kuntze), comb. nov.

Astragalus modestus Weddell, Chlor. Andina 2: 262 (1861). Not Boiss. & Hohen, (1849). — Type from Cuesta de Periguani east of Camargo, *Weddell 3932*.

Tragacantha Weddelliana Kuntze, Rev. Gen. 2: 942 (1891) — Based upon *A. modesta* Wedd.

Astragalus Pilgeri Macbride, Field Mus. Pub. Bot. 11: 25 (1931). — Type from Paucartambo, Cuzco, *Herrera 2315*.

Astragalus punensis Macbride, Field Mus. Pub. Bot. 13 [Fl. Peru 3:]: 400 (1943). — Type from Macusani and Hac. Salcedo, dept. Puna, *Soukup 549*.

RANGE: Rare from southern Peru to northwestern Argentina.

PERU. Cuzco: Hacienda Chuchapaya, Valle del Paucartambo, 3800 m. alt., Feb. 1929, *Herrera 2315* (FM, type of *A. Pilgeri*). Puno: indefinite locality, *Soukup 429* (G) and *549* (G, isotype of *A. punensis*).

BOLIVIA. La Paz: Rinconada, 4200 m. alt., Dec. 16, 1920, *Asplund 1804* (Upsala); Desaguadero, 3900 m. alt., Feb. 3, 1921, *Asplund 6142* (US); Guaqui to Desaguadero, 3850 m. alt., Feb. 3, 1921, *Asplund 2319* (Upsala). Potosi: between San Sebastian and Potosi, 4060 m. alt., Nov. 1932, *Cardenas 281* (G, US). Chuquisaca: Cuesta de Periguani, between Pomabamba and Camargo, prov. Cinti, 3500 m. alt., Jan. 11–13, 1846, *Weddell 3932* (type of *A. modestus*, Paris).

ARGENTINA. Tucuman: puna between La Puerta and Los Cardones, Cumbre Calchaquies, Tafi, 4400 m. alt., Jan. 30, 1933, *Burkart 5384* and *5408* (G). Catamarca: Reales Blancos, Feb. 3, 1930, *Castellanos 30/488* (G).

Assembled here under the name *A. Weddellianus* is a variable group of plants all evidently related to *A. tarijensis* and differing from it only in the reduced habit of growth, glabrous ovary and fruit, and generally more northern distribution. These distinctions are weak and perhaps the plants can be accommodated under *A. tarijensis* as further variants of that variable species.

The type of *A. modestus* has leafy stems 1–2 cm. long, 2–4-flowered peduncles 5–10 mm. long, practically glabrous stems and leaves, and 6–8-jugate elliptic-oblong leaflets. The type of *A. Pilgeri* is sparsely and persistently strigose but is otherwise similar to the type of *A. modestus*. The cited collections of Asplund and Cardenas have more reduced stems

and peduncles than in the type of *A. Pilgeri* but agree with it in other details including pubescence. The collections from Argentina have glabrous herbage and so more closely resemble the type of *A. modestus*. The cited material from Puna, including the type of *A. punensis*, is glabrous and differs in its larger corollas and deeper calyx from other collections examined. Possibly further collecting may prove it to be a distinguishable entity worthy of recognition.

60. **Astragalus Bustillosii** Clos in Gay, Fl. Chile 2: 117 (1846); Wedd. Chlor. Andina 2: 257 (1861). — Type from Cordillera de la Patos, *Gay 489*.

Phaca depauperata Phil. Fl. Atac. 14 (1860). — Based upon collections from Ag. Veras, and Puquios, *Philippi*.

Astragalus depauperatus (Phil.) Reiche, Anal. Univ. Chile 97: 537 (1897), and Fl. Chile 2: 80 (1898). Not Ledeb. (1831).

Phaca saxifraga Phil. Cat. Pl. Itin. Tarapaca 14 (1891). — Type from Peñon, prov. Atacama, *Philippi*.

Astragalus brachycalyx Phil. Cat. Pl. Itin. Tarapaca 15 (1891); Reiche, Anal. Univ. Chile 97: 538 (1897), and Fl. Chile 2: 81 (1898). Not Fischer (1853). — Type from Near Machuca, prov. Antofagasta, *Philippi*.

Tragacantha atacamensis Kuntze, Rev. Gen. 2: 940 (1891). — Based upon *P. depauperata* Phil.

Astragalus atacamensis (Kuntze) Fries Nova Acta R. Soc. Sci. Upsala, ser. IV, 1[1]: 134 (1905).

Astragalus tarapacanus Speg. Anal. Mus. Nac. Buenos Aires II, 4: 264 (1902). — Based upon *A. brachycalyx* Phil., not Fischer.

RANGE: Moist gravels at high altitudes from Antofagasta and Jujuy south to Tucuman, Mendoza and Coquimbo.

CHILE. Antofagasta: Machuca, lat. 22° 36′, *Philippi* (Santiago, type of *A. brachycalyx*). Atacama: Peñon, lat. 26° 50′, Jan. 1885, *Philippi* as *P. saxifraga* (US, K, BD); Desert of Atacama, *Philippi* as *P. depauperata* (K, BD, Boiss); Laguna Grande, 3400 m. alt., 1926, *Johnston 5940* (G, US, K); Laguna Chica, 3200 m. alt., 1926, *Johnston 5970* (G, US, Stock); Laguna Valeriano, 4000 m. alt., 1926, *Johnston 6041* (G, US, K, Stock). Coquimbo: Baños del Toro, Jan. 1904, *Reiche* (G); Cord. de Doña Rosa, *herb. Reed* (K); Cord de Los Patos, 3000 m. Jan. 1837, *Gay 489* (Paris, type of *A. Bustillosii*); Polcura, Cord. de Illapel, Jan. 1888, *Philippi* (G); Chile, *Gay* (G).

ARGENTINA. Jujuy: Santa Catalina, 3650 m. alt., 1901, *Claren 11465* in pt. (Stock). Salta: Queb. Quesera, ca. 3500 m. alt., 1932, *Keidel 1* (LP); Cerro de Cachi, 3600 m. alt., 1927, *Venturi 6705* (US). Tucuman: Tafi del Valle, fl. violet, 1907, *herb. Spegazzini 2028* (LP). San Juan: Vega de la Sepultura, Valle Cura, ca. 3800 m. alt., Jan. 7, 1930, *Perez Moreau 30/95* (G). Mendoza: Puente del Inca, March 1908, *herb. Spegazzini 2029* (LP); below Paso de la Cruz Piedra, 3000 m. alt., *Kuntze* (NY).

Among the South American species of the genus *A. Bustillosii* is unique in the possession of slender rhizomes. The slender stems of the plant elongate and spread through the moist sand or gravel in which it grows. A single plant can form a large area of turf. It much resembles *A. minimus* in habit, foliage, and gross aspect and perhaps it is related to that species. It is quickly distinguished from this possible relative, however, by its very different underground parts, its larger flowers, and very different fruit. The pods are strongly compressed laterally and flattened. The lower suture is inflexed only near the base of the pod and the false

septum is absent or only very weakly developed. The valves are commonly 10–13 mm. long and 5–7 mm. broad. The pedicels and peduncles are only slightly more developed than in *A. minimus*. The species is a rather stable one and has a range which lies to the south and west of *A. minimus*. With the possible exception of *A. brachycalyx* Phil., the species I have listed above are all clear synonyms. Through the kindness of Prof. Espinoza I have examined part of the type of *A. brachycalyx*. It appears to be a depauperate plant of *A. Bustillosii* from an unfavorable habitat. The material is scanty and shows only a single immature fruit but seems to fall reasonably well into the present species.

61. **Astragalus uniflorus** DC. Astrag. 243, t. 50 (1802), and Prodr. **2**: 306 (1825); Weberb. in Engler & Drude, Veg. Erde 12: 209, fig. 45 (1911). — Type collected by Dombey at Huasa-Huasi, Peru.

Astragalus Herzogii Ulbrich, Mededell. Rijks Herb. 27: 53 (1915). — Type from Valle de Choquecota, Cord. Quimza Cruz, Bolivia, *Herzog 2340*.

RANGE: High mountains of central Peru south to the Bolivian Plateau.

PERU. Junin: Hacienda Arapa near Yauli, 4400 m. alt., 1902, *Weberbauer 290* (BD, basis of Weberbauer's illustration!); Oroya, 4300 m. alt., 1903, *Weberbauer 2620* (BD); Alpamina Mines, 1904, *Weberbauer 5111* (BD); Cerro de Pasco, ca. 4200 m. alt., 1923, *Macbride 3066* (FM); Huasa Huasi, 1779, *Dombey* (Paris, type). Apurimac: crest of Socollaccas Pass, 4000 m. alt., open puna among grass, fl. lavender, Nov. 11, 1935, *West 3829* (UC). Cuzco: La Raya, ca. 4300 m. alt., 1925, *Pennell 13526* (FM.)

BOLIVIA. La Paz: Huaycho to Molo, 4200 m. alt., 1903, *Hill 123* (K)*; Sorata, 3900 m. alt., Feb. 1886, *Rusby 1925* (NY); near Sorata, 3800 m. alt., Nov. 1857, *Mandon 713* (G, K, BM, BD, Boiss, Del, Paris); hills above Ancoraimes, 4050 m. alt., 1904, *Hill 124* (K); near top of Huallata Pass, 4233 m. alt., *Conway 39* (K); Corocoro, 4400 m. alt., Feb. 16, 1921, *Asplund 2487* (Upsala); Palca to La Paz, 4200–4700 m. alt., *Pflanz 136* and *226* (BD); La Paz to Palca and Illimani, 3600–4800 m. alt., *Hauthal 317* and *325* (BD); Laguna la Apacheta, Illimani, 4670 m. alt., *Stübel 24a* and *29a* (BD); Cord. Quimza Cruz, valley of the Choquecota, 4300 m. alt., Oct. 1911, *Herzog 2340* (BD, type of *A. Herzogii*). Oruro: Cord. de Azanaque, 4400 m. alt., Dec. 26, 1926, *Troll 2995* (BD). Chuquisaca: Cuesta de Periguani between Pomabamba and Comargo, prov. Cinti, Jan. 11–13, 1846, *Weddell 3934* (Paris). Cochabamba: Cord. de la Llave, prov. Ayopaya, 4000 m. alt., Dec. 1846, *Weddell 4137* and *4138* (Paris). Indefinite: *Bang 1792* (G) and *1879* (G, NY, US).

A low caespitose plant of high altitudes with glabrous herbage and large, usually brightly colored reddish purple flowers. Collectors, attracted only by its conspicuous flowers, have failed to collect the fruit of this species. Among all the collections examined only three (*Asplund 2487*, *Bang 1879* and *Rusby 1925*) show the fruit. The legume is a remarkable one. It is glabrous, rugulose and completely 2-celled with a coarse septum almost as tough and firm as the valves, and is rigidly inflated and dorsi-ventrally somewhat compressed so that measurements across it about equal those for its total length and exceed its dorsi-ventral measurements. Hence it becomes 4–9 mm. long and thick and only about 3–7 mm. high. Viewed from below the legume appears didymous, being obtuse or rounded at the base, broadly retuse at the apex, and having a narrow deeply inflexed lower suture. The valves are flattened on the back and sides and

hence are somewhat rectangular. The flowers are solitary on peduncles that become 5–10 mm. long in fruit. The pedicels are 1–2 mm. long. The calyx-tube is elongate.

The species is best known from the department of La Paz in Bolivia. This Bolivian plant, of which a form has been described as *A. Herzogii*, is clearly conspecific with the original *A. uniflorus* of the western Andes of Peru. The collection at Paris labeled "in altis et frigidis, Huasa-Huasi, 1779, Dombey," is apparently the basis for the plate, as well as for the description originally given by De Candolle. The species is a very distinct one and is readily recognized.

62. **Astragalus Venturii,** sp. nov.

Planta perennis caespitosa; ramis 2 4 mm. crassis stipulis ocreaceis aureis strictis obtectis e caudice horizontali laxe ramoso orientibus; ramis foliatis perbrevibus 5–10 mm. longis, internodiis stipulis brevioribus; foliis vix numerosis ascendentibus, rhachi 6–20 mm. longa, foliolis saepe 2–3-(rariter 4-) jugatis 2–7 mm. longis 2 3 mm. latis oblanceolatis pilos adpressos vix abundantes strigosos non rariter subflaventes gerentibus; pedunculo laxe 1–2-flori 3 12 mm. longo; pedicello 1–2 mm. longo; calycibus 4–5 mm. longis sparse strigosis pilos nigrescentes non rariter gerentibus, lobis subulatis 1–2 mm. longis saepe nigro-strigosis; vexillo ca. 7 mm. longo (lamina 5–6 mm. lata) quam carina 3 mm. et alis 1 mm. longiore; ovario glabro; leguminibus glabris compressis unilocularibus (vix septatis) margine inferiore saepe plus minusve inflexis, valvulis 4–7 mm. longis et 2.5–5 mm. latis.

ARGENTINA. Jujuy: Tilcara, 3200 m. alt., fl. blue, Feb. 1927, *Venturi 7417* (type, U. S. Nat. Herb.); Tilcara, 3200 m. alt., Feb. 1927, *Venturi 7411* (US); Cerro La Solidad, dept. Humahuaca, 3500 m. alt., fl. blue, Jan. 1927, *Venturi 9018* (G, US). Salta: Cerro de Cachi, fl. bluish, March 1927, *Venturi 6674* (US); Cerro de Cachi, 4400 m. alt., fl. violet, March 1927, *Venturi 6691* (US). Tucuman: Sierra del Cajon, dept. Tafi, 3500 m. alt., fl. violet, May 1926, *Venturi 7609* (US). Catamarca: Sierra del Anconquija, dept. Santa Maria, 4600 m. alt., fl. violet, Jan. 1926, *Venturi 7605* (US).

The relationship of this plant is uncertain. Among the caespitose species of northwestern Argentina it is quickly distinguished by the yellowish green color imparted to the plant by the yellowish stipules that ensheathe the caudex and, partially, by the yellowish hairs on the herbage. The only species readily confused with the species is *A. Burkartii*. The available material is not fully mature and is inadequate for the proper description of its fruiting structures. The immature legumes are variable, some appearing to have both sutures prominent while others have the lower suture strongly intruded.

63. **Astragalus confinis,** sp. nov.

Planta perennis caespitosa; ramulis caudicis paucis gracilibus horizontalibus 1–2 mm. crassis; ramulis foliatis 5–12 mm. longis paucis dense albo-strigosis, internodiis 2 5 mm. longis; foliis pallide strigosis, rhachi 2–5 mm. longa, foliolis 2–4-jugatis oblongi-linearibus 3–10 mm. longis 1–2 mm. latis margine involutis, stipulis 2–4 mm. longis strigosis laxe vel vix imbricatis; pedunculis 1–4 cm. longis apice 2–5-floris; pedicellis 1 mm.

longis; vexillo 6–7 mm. longo (lamina 3–4 mm. lata) quam carina obtusa ca. 2.5 mm. et quam alis 1 mm. longioribus; calyce 3–4 mm. longo pallide strigoso, lobis triangulari-lanceolatis 1–1.5 mm. longis; ovario glabro; leguminibus glabris ca. 8 mm. longis 3–4 mm. latis margine inferiori inflexis, septo membranaceo angustissimo inconspicue.

PERU. Arequipa: near Arequipa, 2000–2500 m. alt., Feb. 13, 1923, *Guenther & Buchtien 1082* (Hamb); Arequipa, 2300 m. alt., Feb. 11, 1923, *Guenther & Buchtien 1081* (type, Hamburg).

CHILE. Tarapaca: between Pachica and Aico, 2400 m. alt., April 15, 1927, *Troll 3305* (BD).

A species evidently related to *A. hypsogenus* of northwestern Argentina and adjacent Bolivia from which it differs sharply in its fewer leaflets, sparser indument, slightly smaller flowers, and glabrous ovary and fruit. Furthermore, the leafy stems seem to be more elongate than in its southern relative. Except for the rudimentary septum and lack of hairs, the fruit of *A. confinis* is very similar to that of its relative.

64. **Astragalus hypsogenus,** sp. nov.

Planta caespitosa; caudice gracili saepe laxe longeque ramoso, ramulis 1–2 mm. crassis cum stipulis 3–6 mm. longis imbricatis sparse strigosis vestitis; foliis pallide strigosis saepe sericeis sed non rariter subglabrescentibus, rhachi 2–5 cm. longa, foliolis lanceolatis vel oblongis plicatis vel margine involutis 3–17 mm. longis 2–3 mm. latis 4–7-jugatis distantibus apice acutis; pedunculis 2–6 cm. longis apice 2–10-floris; pedicellis 1–2 mm. longis; calyce ca. 5 mm. longe strigoso pilis non rariter nigris vestito, lobis 1–2 mm. longis; vexillo 8–10 mm. longo (lamina 4–6 mm. lata apice emarginata) quam carina 3–4 mm. et quam alis angustis 1 mm. longiore; leguminibus saepe sublunatis strigosis 10–15 mm. longis 3–5 mm. altis margine inferiore plus minusve introflexis margine superiore a latere viso plus minusve leviter concavis, septo nullo.

BOLIVIA. Potosi: Atocha, 3700 m. alt., March 19, 1921, *Asplund 6135* (US) and *2974* (Upsala).

ARGENTINA. Jujuy: Esquina Blanca, Feb. 13, 1921, *Castellanos 32* (G); Cerro Incahuasi, dept. Cochinoca, 4500 m. alt., fl. light blue, 1930, *Venturi 10126* (type, Gray Herb.; isotypes, US, BM, Stock); Laguna Tres Cruces, *Claren 11695* (Stock); Moreno, 3800 m. alt., 1901, *Fries 821a* (Stock); Abra del Palamar, 3600 m. alt., 1901, *Fries 821* (Stock); Sierra del Aguila, 3700 m. alt., fl. bluish, 1929, *Venturi 8694* (US); Santa Catalina, 3650 m. alt., *Claren 11442* (Stock). Los Andes: Chorrillos, March, 1930, *Budin 12* (G); San Antonio de los Cobres, Feb. 25, 1927, *Castellanos 27/823* (G). Salta: Punta Cienega, Queb. del Toro, 3350 m. alt., Feb. 1932, *Keidel 4* (LP); Cerro de Cachi, 4000 m. alt., fl. bluish, March 1927, *Venturi 6675* (US). Tucuman: between Estan. Santa Rosa and La Cueva, dept. Chicligasta, 3600 m. alt., fl. violaceous, Jan. 1926, *Venturi 7606* (US).

A very distinct species with evident relationships only with *A. confinis* and *A. crymophilus*. Among the species of northwestern Argentina it is readily recognized by its tufts of silvery strigose leaves and its pedunculate subumbellate cluster of flowers. In general appearance the fruit of *A. hypsogenus* is suggestive of a small fruit of *A. arequipensis*. The upper edge is somewhat concave in lateral outline and the apex is acute. The lower part of the fruit is either flattened or inflexed. There is no false septum developed within the pod. Among the collections cited above

those by Fries and by Claren have been identified by Fries, Nova Acta R. Soc. Sci. Upsala ser. IV, 1[1]: 135–36 (1904), as *A. modestus* and *A. bellus*.

65. **Astragalus crymophilus**, sp. nov.

Planta caespitosa; caudice denso breviter ascendenterque congesti-ramoso; ramulis caudicis 3–10 mm. longis stipulis glabris membranaceis imbricatis dense vestitis; foliis argenteis dense sericeo-strigosis, rhachi 2–5 mm. longa infra medium nuda, foliolis 2–3-jugatis linearibus plicatis distantibus 8–19 mm. longis 1–2 mm. latis; pedunculo 2–15 mm. longo sericeo-strigoso apice 2–6-flore; pedicellis 0.5–1 mm. longis; calycibus 2.5–3 mm. longis sericeo-strigosis, lobis ca. 1 mm. longis linearibus vel lanceolatis tubo campanulato subaequilongis; vexillo 5–6 mm. longo, lamina 2–3 mm. lata obovata apice emarginata quam alis angustis 1 mm. et quam carina obtusa 2 mm. longiori; ovario albiter strigoso; legumine oblongo compresso strigoso 6–8 mm. longo 2–4 mm. alto 1–2 mm. crasso, margine superiori a latere viso recto vel leviter convexo, margine inferiori valde introflexo, septo interiore membranaceo angusto 0–0.5 mm. alto inconspicuo; ovulis 10–12.

BOLIVIA: Uyuni, dept. Potosi, 3700 m. alt., March 1923, *Asplund 6134* (type, U. S. Nat. Herb.) and *3148* (Upsala); Puna Patanca, dept. Tarija, 3800 m. alt., March 27, 1904, *Fiebrig 2912* (G, US, K, BM, BD).

ARGENTINA: Mina Perdida, dept. S. Catalina, Jujuy, 4100 m. alt., Jan. 25–26, 1901, *Claren 11499* in pt. (Stock).

A well marked species most closely related to *A. hypsogenus*, from which it differs in its denser more silvery indument, fewer linear leaflets, oblong rather than lunate pods and narrow but definite false septum within the fruit. The collection from Jujuy consists of a single plant mixed with a reduced form of *A. micranthellus*. Fries determined and reported the collection as *A. modestus*.

66. **Astragalus pusillus** Vogel, Verhandl. K. Leop.-Carol. Akad. Naturf. 19: suppl. 19 (1843); Weddell, Chlor. Andina 2: 259 (1861). — Type from Alto de Toledo, Peru, *Meyen*.

RANGE: High altitudes from southern Peru southward across the Bolivian plateau to the mountains of northwestern Argentina.

PERU. Puno: Poto, prov. Sandia, 4500 m. alt., 1902, *Weberbauer 993* (BD); cordilleras near lake Ayapata, *Lechler 1730* (K); Azangaro, June 1854, *Lechler 3242* (K); Crucero, 1920, *Stordy* (K); Pucará, 3700 m. alt., *Weberbauer 438* and *440a* (BD); Moho, 1848, *Weddell 4414* (Paris). Arequipa: above Chivay, prov. Caylloma, 4200 m. alt., 1914, *Weberbauer 6896* (BD, FM); Alto de Toledo, 4650 m. alt., 1831, *Meyen* (BD, type); near Arequipa, 2200–2500 m. alt., 1923, *Guenther & Buchtien 1114*, *1117*, *1118* and *1120* (Hamb). Moquegua: Coalaque near Lagunillas, 4400 m. alt., 1923, *Guenther & Buchtien 1866* (Hamb).

CHILE. Arica: Cord. de Volcan Tocora, Ancara, 4300 m. alt., *Werdermann 1128* (G, BD, US).

BOLIVIA. La Paz: Achachachi, Ancorairnes and Guatata, 4000–4200 m. alt., 1857–58, *Mandon 712* (G, K, BM, BD, Del, Paris, Stock); La Paz, 4100 m. alt., *Buchtien 64/624* (K, BD, US); Lancha, between La Paz and Coroica, 5000 m. alt., *Mandon 718* (K); La Lancha, Canyon of the Chuquiagillo, 1851, *Weddell* (Paris); Cerro Quimsachata, 13 km. s. of Tiaguanaco, 4200 m. alt., *West 6379* (UC); Challavelina, Feb. 9, 1927, *Troll 3055* (BD); Ulloma, 3900 m. alt., Feb. 2, 1927, *Troll 3119*

(BD); Ulloma, 3850 m. alt., Feb. 21, 1921, *Asplund 4423* (Upsala); Mina La Union, 4400 m. alt., May 4, 1927, *Troll 1939* (BD); Charaña, 4000 m. alt., March 1, 1921, *Asplund 6143* (US) and *2671* in pt. (Upsala); Corocoro, 4300 m. alt., Feb. 16, 1921, *Asplund 2485* (Upsala); Calacoto, 3800 m. alt., March 7, 1921, *Asplund 4432* (Upsala). Potosi: Totorapalca, prov. Linares, 3400 m. alt., 1934, *Hammarlund 426* (Stock); Potosi, 4000 m. alt., 1932–33, *Cardenas 165* (G) and *466* (US). Indefinite: near Coldo, Andes of Pelechuco, 4800 m. alt., April 1865, *Pearce* (BM); prov. de Carangas, Bolivia, *d'Orbigny 1438* (Paris).

ARGENTINA. Salto: Los Potreros, south of Nevado del Castillo, March 1873, *Hieronymus & Lorentz 56* (BD, K, FM).

Bolivian material of this well marked species has been frequently confused with *A. peruvianus*. The latter, however, is readily distinguished by its smaller fruit, its persistent silvery indument, its narrow acute to rounded leaflets, and its usually firm tight yellowish stipular sheaths that commonly form an evident collar about the leaf-rosette. The real relationships of our present species, however, seem to be with the habitally dissimilar *A. arequipensis*. Its sparsely villous pods are ca. 5 mm. long and 3 mm. broad. The lower suture is inflexed and there is a false septum. One of the most distinctive developments of *A. pusillus* is its compacted inflorescence. Terminating the branches of the multicipital caudex and nestling in the center of the rosette of rather coarse leaves, sessile flowers are to be found intermixed with bracts and broad white papery stipular-sheaths. The foliage is villous becoming glabrescent in age. The indument is not lustrous. The leaflets are oblong to obcordate, retuse, and 2–5 mm. broad. The plant is one of the peculiar habit-types characteristic of the Bolivian altiplano.

The only Argentine material I have seen comes from southern Salta. Hosseus, Bol. Acad. Nac. Cien. Cordoba 26: 154, fig. 27 (1922), however, reports *A. pusillus* from the Sierra Famatina, La Rioja, on the basis of six collections which he compared and found conspecific with the material obtained in Salta by Lorentz & Hieronymus (no. 56).

67. **Astragalus Urbanianus** Ulbrich, Bot. Jahrb. 37: 422 (1906); Fiebrig, Bot. Jahrb. 45: 12 (1910). — Type from Calderillo, southern Bolivia, *Fiebrig 3184a*.

BOLIVIA. La Paz: Charaña, 4050 m. alt., March 1, 1921, *Asplund 2671* in pt., mixed with *A. pusilla* (Upsala). Potosi: Potosi, 4000 m. alt., March 1932, *Cardenas 165*, mixed with *A. pusilla* (G). Tarija: Calderillo, 3600 m. alt., March 1904, *Fiebrig 3184a* (BD, type; US, FM); southern Bolivia, 1903, *Fiebrig 3576* (BD).

Very evidently related to *A. peruvianus*, and perhaps only a luxuriant form of that species. From its relative it differs in having, not 1 or 2, but 4–7 flowers clustered in an exceedingly abbreviated subumbellate axillary raceme. The flowers are intermixed with broadly lanceolate bracts. These bracts permit the plant to be distinguished from those forms of *A. peruvianus* which produce several flowers on a given branch of the caudex, for in the latter cases the flowers are separated, not by bracts, but by leaves and stipules. The leaves in *A. Urbanianus* are larger than in *A. peruvianus*, the lanceolate to oblong blade measuring 3–12 mm. and the leaf-rachis 1–5 cm. in length.

68. **Astragalus Dillinghami** Macbride, Pub. Field Mus. Bot. 8: 98 (1930), and l.c. 13 [Fl. Peru 3:]: 396 (1943). — Type from between Tarma and Morococho, *Macbride & Featherstone 1052*.

PERU. Near Tarma, Junin, 4200 m. alt., June 1922, *Macbride & Featherstone 1052* (FM, type).

The type has no fruit. The flowers are in a much shortened raceme and form a cluster among the leaves. The leaves are abundantly villous with loosely appressed silky hairs about 2 mm. long. The plant is evidently related to *A. Urbanianus* but differs in the more abundant and longer hairs of its indument. It may not be specifically distinct.

69. **Astragalus peruvianus** Vogel, Verhandl. K. Leop.-Carol. Akad. Naturfors, 19: suppl. 18 (1843). — Type collected near Pisacoma in southern Peru, *Meyen*.

RANGE: High altitudes in southern Peru, Bolivia and northwestern Argentina.

PERU. Ayacucho?: Santa Inez silver mines (between Ayacucho and Pisco), May 1910, *Weberbauer 5450* (FM, BD). Moquegua: Carumas near Volcan Ticsani, 1925, *Weberbauer 7327* (FM, BD). Tacna: near Pisacoma, 4500 m. alt., 1831, *Meyen* (BD, type).

BOLIVIA. La Paz: La Cumbre, trail to the Yungas, ca. 4700 m. alt., March 28, 1921, *Asplund 0130* (US) and *3846* (Upsala); Chacaltaya, 4800 m. alt., 1908, *Buchtien 1813* (US, BD); near La Paz, 3000 m. alt., 1890, *Bang 660* (G, NY). Potosi: Cerro de Potosi, 4800 m. alt., Feb. 1933, *Cardenas 406* in pt. (US); Potosi, 4000 m. alt., 1936, *Cardenas 600* (G).

ARGENTINA. Tucuman: Cumbre de Calchaquies, 4200 m. alt., *Spegazzini 2104* (LP); El Pelado, 1912, *Rodriguez 442* (G).

Typical *A. peruvianus* usually has the coarse elongate branches of the caudex tightly ensheathed with glabrous tough commonly stramineous stipules. The leaves, with abundant appressed lustrous hairs, are usually small having leaflets mostly 1 mm. or rarely 2 (–2.5) mm. long on rachises 5–10 (–15) mm. long. The solitary (or rarely geminate) flowers are borne among the stipules of the functioning leaves. The species is closely related only to *A. Urbanianus* and *A. Dillinghami*, both of which have larger leaves and abbreviated racemes of flowers. Some forms of *A. peruvianus* suggest *A. deminutivus* in gross habit but these forms may be distinguished from that species by their very different fruit, lustrous more appressed indument, glabrous stipules, etc. Our present plant has been most frequently confused with *A. pusillus*, but that plant has non-lustrous indument, broader emarginate leaflets, much broader papery stipules, and clustered flowers.

Besides the specimens cited above I have in my notes thirteen other collections assigned to *A. peruvianus*. They represent collections identified before I had recognized *A. Urbanianus* as distinct from *A. peruvianus*, and some of them may possibly represent the former species. Those from Peru are, from near Arequipa, 2000–2500 m. alt., 1923, *Guenther & Buchtien 1077, 1353, 1354*, and *1355* (Hamb); Saracocha near Lagunillas, 4400 m. alt., 1925, *Guenther & Buchtien 1164b* (Hamb), and those from Bolivia are, from Rinconada, Yungas Pass, northeast of La Paz, 4100 m. alt., 1928, *Troll 1891* (BD); Chuyuncayani, 1851, *Weddell* (Paris); Chacaltaya, northeast of La Paz, 1928, *Troll 1935* (BD); La Lancha near

La Paz, 5000 m. alt., *Mandon 718* (K, Del); Huari pampa, between La Paz and Palca, 4200–4400 m. alt., 1910, *Pflanz 483* in pt. (BD); Quemsachata near Tiahuanaco, 4300 m. alt. 1877, *Stübel 64* (BD); Copacabana, 4050 m. alt. 1903, *Hill 122* (K); and Quebrada Honda, Potosi, *d'Orbigny 1310* (Paris).

70. **Astragalus Werdermanni,** sp. nov.

Planta dense caespitosa; ramulis caudicis congestis stricte ramosis, vetustioribus stipulis imbricatis membranaceis pallidis dense vestitis; foliis cinereis sparse breviterque strigosis, rhachi 13–18 mm. longa supra medium foliolata, foliolis 5–7-jugatis orbiculato-obcordatis evidenter plicatis 2–2.5 mm. longis 2–3 mm. latis paulo supra medium latioribus apice conspicue emarginatis basi rotundatis sparse strigosis pilis a costa oblique abeuntibus; stipulis 3–4 mm. longis strictis sparse strigosis; pedunculis 1–2-floris, fructiferis 3–7 mm. longis; pedicellis 0.5–1 mm. longis; calycibus sparse strigosis ca. 2.5 mm. longis, tubo membranaceo cupulato, lobis triangularibus ca. 0.5 mm. longis viridibus; corolla ignota; leguminibus subbilocularibus sparse strigosis 5–7 mm. longis 2–3 mm. crassis 3–4 mm. altis, margine superiori a latere viso recto, margine inferiore a latere viso valde convexo, sutura inferiore valde inflexa in loculo leguminis septum membranaceum 2–3 mm. altum gerente; seminibus pluribus.

CHILE: Chislluma, Cord. Volcan Tacora, Arica, depressed, a few plants between rocks, 4500 m. alt., April 1926, *Werdermann 1439* (type, Berlin).

A well marked species probably most closely related to *A. casapaltensis* Ball, Jour. Linn. Soc. London **22**: 36 (1885), a species known only from high altitudes in central Peru (cordilleras of Lima and Junin), which differs from our present plant in its fewer, more conspicuously emarginate leaflets that bear more persistent and more appressed shorter hairs. The proposed Chilean species is readily recognized by its very broadly obcordate, strongly folded leaflets which are strigose with numerous scattered closely appressed hairs oriented obliquely to the midrib. The fruit has a very well developed, almost complete, membranous false septum.

71. **Astragalus minutissimus** Weddell, Chlor. Andina **2**: 257 (1861). — Type from "dept. Cuzco," *Gay 629*.

PERU. Cuzco: "dept. Cuzco," *Gay 629* (Paris, type). Puno: Mullapata near Moho, 3125 m. alt., 1919, *Shepard 110* (G, NY, US); between Huaicho and Moho, 1903, *Hill 126* (K).

BOLIVIA: La Paz: Isla del Sol, Lake Titicaca, 3840 m. alt., March 1910, *Buchtien* (US). Cochabamba: Challa Pass, 4500 m. alt., March 17, 1892, *Kuntze* (NY).

This species is very closely related to *A. alpamarcae* Gray, U. S. Explor. Exped. 1: 417 (1854), which is known only from a few collections in the cordillera of central Peru (Cerro de Pasco, Junin, *Mathews 924;* Alpamarca, Lima, *U. S. Explor. Exped.*, type; and Casapalca, Lima, *Macbride & Featherstone 837*). The plants of the northern, older species have 7–9 pairs of leaflets. The leaves in our present southern form bear only 3–5 pairs of leaflets. Otherwise the plants seem very similar. The differences between *A. minutissimus* and *A. alpamarcae* are probably not of

specific value. Certainly the two are very much alike in general appearance. In gross aspect *A. minutissimus* is frequently very similar to *A. deminutivus*. The fruits of these species, however, are very different, and furthermore the leaflets of *A. minutissimus* show a very much stronger tendency towards glabrescence than do those of *A. deminutivus*.

72. **Astragalus minimus** Vogel, Verhandl. K. Leop.-Carol. Akad. Naturfors. 19: suppl. 18 (1843). — Type from Alto de Toledo, east of Arequipa, *Meyen*.
Astragalus colliculus Rusby, Mem. Torrey Bot. Club 3: 19 (1893). — Type from near La Paz, *Bang 660*.

PERU. Arequipa: Alto de Toledo, 4600 m. alt., *Meyen* (BD, type).

BOLIVIA. La Paz: near La Paz, 3000 m. alt., *Bang 660* (NY, type of *A. colliculus*), Charaña, 4000 m. alt., March 1, 1921, *Asplund 6145* (US) and *2672* (Upsala).

CHILE. Arica: Ancara, Cord. Volcan Tacora, 4300 m. alt., April 1926, *Werdermann 1136* (G, BD).

ARGENTINA. Jujuy: Moreno, 3500 m. alt., Dec. 14, 1901, *Fries 916* (Stock). Los Andes: San Antonio de los Cobres, Feb. 21, 1927, *Castellanos 27/813* (G). Tucuman: between La Puerta and Los Cardones, Cumbre Calchaquies, 4400 m. alt., Jan. 30, 1933, *Burkart 5386* (Burkart).

This species is closely related to *A. minutissimus* and *A. alpamarcae*, but has a more prostrate habit and an indument of shorter much more appressed hairs. In gross habit it much resembles *A. Bustillosii* which differs in its rhizomes, larger flowers, and much larger compressed fruit. As in *A. Bustillosii*, our present species frequently has the fruit elevated on a short but definite 1–2-flowered peduncle 2–6 mm. long.

The type specimen of *A. colliculus*, *Bang 660* at New York, represents two forms of the present species. Bang's collection was evidently a great mixture, for in addition to the two forms of *A. minimus* at New York, material of *A. peruvianus* and of a depauperate form of *A. arequipensis* has been distributed under his no. 660 to other herbaria. Rusby's description of *A. colliculus* seems to include details derived from the material of all the species mentioned. To make matters worse, *Mandon 712* at New York, which was cited by Rusby, is also a mixture consisting of plants of *A. pusillus* and *A. minutissimus*. If Rusby's species is not to be discarded as a confused mixture, it must be taken as a synonym of *A. minimus* since the material of *Bang 660* retained at New York by Rusby all belongs to that species.

73. **Astragalus pulviniformis** Johnston, Physis 9: 309 (1929). — Type collected at Vega Cadillo in northwestern San Juan, Argentina, *Johnston 6128*.

ARGENTINA. Vega Cadillo, Rio Tagua, San Juan, 3000 m. alt., 1926, *Johnston 6128* (G, type; K, Paris, Stock).

A very well marked species which has its closest relations in *A. Reichei* and *A. deminutivus*. Its dense pulvinate habit, strongly marcescent dusky leaves, scattered hyaline stipules, slender elongating stems, and larger fruit readily distinguish it from the species mentioned.

74. **Astragalus Reichei** Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902).
Phaca compacta Phil. Cat. Pl. Itin. Tarapaca 14 (1891). — Type from Queb. Machuca, prov. Antofagasta, 3200 m. alt., *Philippi*.

Astragalus compactus (Phil.) Reiche, Anal. Univ. Chile 97: 539 (1897), and Fl. Chile 2: 82 (1898). — Not Lam. (1789).

BOLIVIA. Rosario, prov. Pacajes, dept. La Paz, 3750 m. alt., 1920, *Shepard 227* (G); above Animas Mine, west of Chocaya, dept. Potosi, 4250 m. alt., *West 6069* and *6070* (G).

CHILE. Peña Blanca, Cord. Arr. Coyacagra, prov. Tarapaca, 4000 m. alt., *Werdermann 1117* (G, K, BD); Atacama Desert [Queb. Machuca, prov. Antofagasta, 3200 m. alt.], *ex Philippi* as *P. compacta* (K, BD).

This species has close relationship only with the more easterly and southerly ranging *A. flavocreatus*. The short simple or strictly branched stems are erect or ascending from the crown of the deep root. They are covered with the leaves of seasons past and crowded to form a dense mass commonly intermixed with some dirt. The stipules of *A. Reichei* are pale and are not so firm nor so closely appressed to the stem as are those of *A. flavocreatus*. The herbage of *A. Reichei* is slightly more grayish than in its relative.

75. **Astragalus flavocreatus**, sp. nov.

Planta perennis e radice profunda recta oriens; caudice saepe laxe ramoso plus minusve horizontali, ramulis funiculiformis gracilibus 1–1.5 mm. crassis stipulis stramineis strictis imbricatis vestitis vestigiis foliorum haud gerentibus; foliis apice ramulorum stipulosorum caudicis aggregatis pilis haud abundantibus (0.2–0.6 mm. longis rectis adpressis) vestitis vetuste deciduis; rhachi 5–15 mm. longa tertiam partem inferiorem efoliolata; foliolis 0.5–1.5 mm. longis obovatis vel ellipticis saepe subplicatis supra subglabris apice rotundis vel subemarginatis; stipulis stramineis ocreatis opacis internodiis ramuli subaequilongis vel longioribus persistentibus 2–4 mm. longis juventate laxe et vetuste stricte vaginatis dorse saepissime glaberrimis margine apicem versus ciliatis; pedunculis perinconspicuis inter stipulis occultis 1–2 mm. longis; floribus solitariis; calyce 2–3 mm. longo haud vel vix pedicellato imam ad basim per bracteam 1–2 mm. longam strictam suffulto, tubo cupulato pilis sparsis adpressis vestito, lobis angustis ca. 0.5 mm. longis breviter villosis; corolla violacea, vexillo 6–7 mm. longo, lamina suborbiculari ca. 5 mm. diametro apice emarginata; carina obtusa quam vexillo ca. 3 mm. breviore; alis 4–5 mm. longis supra medium ut videtur patentibus; leguminibus subglobosis ca. 2 mm. longis villosis unilocularibus biseminatis, sutura inferiore inflexa.

BOLIVIA. Cerro de Potosi, 4800 m. alt., 1933, *Cardenas 406* (G) and *406* in pt. (US); Potosi, 4000 m. alt., 1932, *Cardenas 166* (G).

ARGENTINA. Salta: Cerro de Cachi, 4000 m. alt., 1927, *Venturi 6704* (US). Catamarca: Sierra Anconquija, 4200–4600 m. alt., *Venturi 6626* and *6627* (US). Tucuman: Cumbre Calchaquies, dept. Tafi, between La Puerta and Los Cardones, 4400 m. alt., Jan. 30, 1933, *Burkart 5385* (type, Gray Herb.); Est. Santa Rosa, dept. Chicligasta, 3600 m. alt., 1924, *Venturi 6625* (US). La Rioja: Alto Blanco, Sierra Famatina, 1928, *Castillanos 28/182* (G).

This plant is evidently related to *A. Reichei*, but its habit of growth, as well as various intangibles of pubescence, stipules, etc., permit it to be distinguished from that species. The caudex of *A. Reichii* is a compacted mass of strictly ascending stems and persistent old leaves. It is very different from the more spreading superficial caudex of leafless rope-like stems developed by *A. flavocreatus*. The tightly ensheathing straw-

colored stipules which clothe its more elongate and loosely branched stems, and the general lack of persistent old leaves, make *A. flavocreatus* a more neat and attractive plant and permit it to be quickly distinguished from other caespitose species. The flowers of *A. flavocreatus* have a bract tightly appressed about one side of the calyx. This is the bract borne at the apex of the reduced peduncle. From its axil the solitary flower is produced. The calyx is sessile. The apparent pedicel, accordingly, is really the reduced peduncle. This pedicel-like peduncle in *A. flavocreatus* is usually twice the length of that found in *A. Reichei*. It is usually well hidden in the stipular sheathes.

76. **Astragalus deminutivus**, sp. nov.

Planta multiceps cinerea dense caespitosa 2–15 cm. diametro; ramulis caudicis cum stipulis et reliquiis conspicuis congestis foliorum abundanter vestitis; foliis villosulis numerosis deminutivis, rhachi 1–2 cm. longa tertiam partem inferiorem efoliolata; foliolis 5 7-jugatis orbicularibus vel anguste ovatis saepe ca. 1 mm. longis margine laxe involutis apice rotundis; stipulis vaginatis amplis chartaceis albidis villoso-strigosis valde imbricatis saepe 4–5 mm. longis; floris axillaribus solitariis subsessilibus; calycibus 3–5 mm. longis villosis imam ad basim bracteam lanceolatam gerentibus, tubo chartaceo profundo, lobis linearibus herbaceis 1–1.5 mm. longis; vexillo corollae caeruleo 7–8 mm. longo quam carina 2–3 mm. longiori, lamina 3–4 mm. lata apice emarginata; alis caeruleis quam carina pallida obtusa 1–1.5 mm. longioribus supra medium ut videtur patentibus; ovario strigoso; leguminibus oblique subglobosis ca. 2 mm. longis et 1.5 mm. crassis subtus introflexis; seminibus 1–2 saepe 2 mm. diametro.

BOLIVIA. La Paz: General Campero, 3900–4200 m. alt., March 5, 1921, *Asplund 6140* (US) and *2780* (Upsala). Potosi: Cerro de Potosi, 4800 m. alt., 1933, *Cardenas 406* in pt. (US); Uyuni, 3700 m. alt., March 24, 1921, *Asplund 6141* (US) and *3138* (Upsala); Rio Mulalo, prov. Porco, 1934, *Hammarlund 464* (Stock). Tarija: Puna Patanca, 3700 m. alt., 1904, *Fiebrig 2608* (type, Gray Herb; K, BD, Paris).

ARGENTINA. Los Andes: Susquis, March 7, 1927, *Castellanos 27/818* (G). Jujuy: Laguna Tres Cruces, 1901, *Claren 11657* (Stock).

The specimens I have cited above are certainly conspecific and merit description as a new species. They include the plant incorrectly called *A. Reichei* by Fries, Nova Acta R. Soc. Sci. Upsala ser. IV, 1^1: 134 (1905). Hosseus, Bol. Acad. Nac. Cordoba **26**: 154, fig. 28 (1922), has given an illustration of *Claren 11657*, which is the basis of Fries' note, and properly expresses a doubt as to the correctness of Fries' identification.

Closely related to *A. deminutivus* and perhaps only a robust form of this species are two collections made in the dept. of Potosi by Asplund. These collections are, — Uyuni, 3700 m. alt., March 24, 1921, *Asplund 6139* (US) and *3137* (Upsala), and Atocha, 3700 m. alt., March 20, 1921, *Asplund 6138* (US) and *3025* (Upsala). They differ from typical *A. deminutivus* in having the pods more elongate and larger (oblong and 3–5 mm. long), the seeds smaller (1.3–1.5 mm. broad) and more numerous (3–6), the leaves larger (rhachis ca. 3 cm.), and the leaflets larger (1–2 mm.) and somewhat elongate. On Cerro de Chani, Jujuy, Argentina,

Venturi (no. 8527, US) has obtained still another form which is tentatively placed under *A. deminutivus*. This form has glabrous stipules.

77. **Astragalus Dielsii** Macbride, Field Mus. Pub. Bot. 11: 24 (1931), and l.c. 13 [Fl. Peru 3:]: 396 (1943). — Type from Yanashallos, west of Huallanca, dept. Ancash, *Macbride & Featherstone 2479*.

PERU. Yanashallas, Ancash, 4800 m. alt., Oct. 2, 1922, *Macbride & Featherstone 2479* (FM, type; BD); mountains west of Oroya, 4300 m. alt., Nov. 23, 1902, *Weberbauer 1704* (FM, BD).

This is an outlying northern relative of *A. deminutivus*. Its stipules are conspicuously and permanently strigose, and though white at first soon become very dusky in color.

UNPLACED SPECIES

Astragalus Cuatrecasasii Macbride, Candollea 7: 221 (1937), and Pub. Field Mus. Bot. 13 [Fl. Peru 3:]: 394 (1943). — Peru, *Ruiz & Pavon*.

Based upon a flowering specimen at Madrid said to have been collected somewhere in Peru by Ruiz & Pavon. Among the notable features of the type are the numerous leaflets (9–12 pairs), the black appressed hairs on its calyx, and the rather elongate stems and accordingly laxly caespitose habit. It appears to be a relative of *A. minimus* Vogel and is, perhaps, even a form of that species. Lacking fruit, however, its identity remains uncertain.

Phaca diminutiva Philippi, Cat. Pl. Itin. Tarapaca 14 (1891). — "Inter Aguas calientes et Socaire. . . . lecta"; not *A. deminutiva* Johnston.

A very small caespitose plant with pallid appressed indument. The single specimen was collected with the type of *Phaca cryptantha* Phil. Reiche, Fl. Chile 2: 80 (1898), places both *P. cryptantha* and *P. diminutiva* as synonyms of *A. clandestinus* (Phil.) Hieron. which is called *A. cryptobotrys* in this paper. This is perhaps correct. In any case the name may be discarded since the trivial epithet is preoccupied under *Astragalus*. Prof. Espinosa could not locate the type in the Museum at Santiago.

Astragalus Gilliesi Philippi, Anal. Univ. Chile 31: 393 (1862), and Linnaea 33: 48 (1864). — "Portezuelo del Portillo, lado de Mendoza," 1860–61, *Diaz*.

This species was described without mature fruit. Judging from the description it might be a form of *A. Arnottianus* (Gillies) Reiche, or perhaps even a form of *A. carinatus* H. & A. I asked Prof. Espinosa for the privilege of examining a fragment of this type and was loaned material labeled "*Astragalus Gilliesii*, Portillo, lado de Mendoza, 1861–62, *W. Diaz*." This consisted of foliage and fruit of *A. Berteri* and flowers of *A. Cruckshanksii*. The material is not covered by the original description.

Astragalus gracilis Romero, Bol. Direc. Nac. Estad. y Estud. Geogr., La Paz, sec. Epoc. III, Nos. 31-33, pg. 45 (1920). — Not Nutt. (1817), nor Stev. (1842).

This species was described as follows in Romero's paper on the flora of the vicinity of La Paz, Bolivia: "*Astragalus gracilis*, sp. n. B. D. R.

Esta plantita erecta, delgada, con estipulas aladas, tiene foliolos linearos, semi-plegados, agudos y 8 yugados; sus espigas llevan pocas florecillas, la corola es blanca azuleda de 1 cm. de largo. Especie que la hemos recogido en los cerros de esta ciudad [La Paz]." This description, for the transcript of which I am indebted to Prof. Cardenas, is not detailed enough for the recognition of the species. The name is invalid in any case since it has two earlier homonyms.

Astragalus infirmus Steudel, Nomencl. ed. 2, 1: 161 (1840), nomen.

This name was applied to *Bertero 820* from Chile. Among Steudel's specimens at Paris I could find no *Astragalus* bearing this number. The name, possibly, may refer to an *Adesmia*.

Astragalus lanuginosus Clos in Gay, Fl. Chile 2: 121 (1846); Reiche, Anal. Univ. Chile 97: 566 (1897), and Fl. Chile 2: 109 (1898). Not Kar. & Kir. (1841).

Tragacantha Gayana Kuntze, Rev. Gen. 2: 941 (1891). — Based upon *A. lanuginosus* Clos.

Astragalus hurtadensis Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 4, 4: 265 (1902). — Based upon *A. lanuginosus* Clos.

This species was based upon specimens lacking both flowers and fruit. It is represented at Paris by two sheets, evidently parts of a single collection. The label written by Gay reads, "492 Pr. de Coquimbo, *Astragalus ? lanuginosus* Clos, Fl. Chil. Cl. Gay, nait sur les collines exposé et sablonneuses des basses cordilleres de hurtado — a la Coipa, haut 1639 m., passé fleur au janvier, tres rare." If this plant is really a species of *Astragalus* it is one entirely unknown to me. However, I incline towards the opinion that it is an *Adesmia* or some other genus, rather than an *Astragalus*.

Astragalus Philippianus (Kuntze) Hauman, Anal. Soc. Cien. Argentina 86: 281 (1918).

Phaca ? amoena Philippi, Linnaea 28: 620 (1857). — In cordillera de la Campania, pro. Santiago, Nov. 1833, *Germain*.

Astragalus amoenus (Phil.) Reiche, Anal. Univ. Chile 97: 569 (1897), and Fl. Chile 2: 112 (1898). — Not Fenzl (1842).

Tragacantha Philippiana Kuntze, Rev. Gen. 2: 941 (1891). — Based upon *P. amoena* Phil.

Astragalus santiagensis Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 265 (1902). — Based upon *P. amoena* Phil.

A spreading silky-strigose perennial with united stipules. The type has flowers but no fruit. Reiche, l.c., has suggested that it may be a form of *A. Germaini*. This may be correct though the description might also apply to a form of *A. Cruckshanksii*.

Astragalus pictus Steudel, Nomencl. ed. 2, 1: 163 (1840). — Based on *A. bicolor* Desf.

Astragalus bicolor Desfontaines, Cat. Hort. Paris, ed. 3, additamenta 473 (1832–33), nomen, from "Chili." — Not Lam. (1783).

No description has ever been associated with the two names above cited. Desfontaines treats the species as follows, "*bicolor* H. P. Chili, Temp. 4 " The name is a nomen nudum and its application wholly obscure.

Astragalus quindecimjugas (Phil.) Reiche, Anal. Univ. Chile 97: 540 (1897), and Fl. Chile 2: 83 (1898).

Phaca quindecimjuga Philippi, Anal. Univ. Chile 21: 443 (1862), and Linnaea 33: 41 (1864). — "Cord. de Doña Ana, prov. Coquimbo, ca. 4000 ft. alt. *Volckmann*."

Described as a plant with connate stipules, slender sparsely silky ascending stems, glabrescent leaves, oblong-linear 15-jugate (8 mm. long and 4 mm. wide) leaflets, and elongate peduncles. The corolla is said to have the wings very evidently shorter than the keel. Concerning the fruit Philippi says, "El unico fruto que tiene el ejemplar es todavia verde i casi globoso." Reiche describes the fruit as, "Legumbre (en estado maduro desconocida) casi globosa, pelada con varias semillas." Fragments of the type loaned me by Prof. Espinosa show the leaves to be folded, glabrous except for a few appressed hairs along the midrib and about the margin near the apex. The ovary is glabrous and the flower in all details similar to that of *A. palenae*. I believe that *A. quindecimjugus* is based upon a collection from southern Chile and falsely labeled as from the andes of Coquimbo. It probably represents *A. palenae* var. *grandiflorus* Speg.

Astragalus sphaerocarpus Desfontaines, Cat. Hort. Paris ed. 3, additamenta 473 (1832–33), nomen.

This is a garden name which has never been associated with a description. Desfontaines published merely the following concerning it: "*sphaerocarpus* H. P. Chili. Temp. 4."

Arnold Arboretum,
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SECOND SUPPLEMENT TO THE SPONTANEOUS FLORA OF THE ARNOLD ARBORETUM

ERNEST J. PALMER

THE FIRST CATALOGUE of the Spontaneous Flora of the Arnold Arboretum, published in 1930[1], contained the names of 610 flowering plants and ferns, and a supplement in 1935[2] reported the discovery of 173 additions. The present paper adds 148 names, three of which are substitutes for ones published in previous lists. This brings the number of species, varieties, forms and hybrids that have so far been found growing without cultivation to the rather surprising total of about 930.

In the more than ten years that have elapsed since the last publication a diligent search has been carried on but, naturally, with somewhat diminishing results. Approximately sixty percent of the plants listed in this supplement are native to the Boston area and forty percent are introduced. But in some cases it is difficult to determine whether plants of native species are really indigenous or have come from seeds of cultivated plants. This is particularly the case with trees and shrubs, since such a complete collection of them has been established in the Arboretum, and the fruits and seeds are readily distributed by birds and other agencies. In trying to distinguish between native and introduced plants in the list, those native in the area have usually been counted in the first division, although the probability of their having come from cultivated plants is sometimes indicated in the notes.

Among native plants of considerable interest recorded for the first time in this list may be mentioned *Deschampsia flexuosa* (L.) Trin., *Alopecurus geniculatus* L., *Spartina pectinata* Bosc ex Link, *Scirpus planifolius* Muhl., *Carex virescens* Muhl., *C. aestivalis* M. A. Curtis, *C. laxiculmis* Schwein., *Anychia canadensis* (L.) B.S.P., *Corydalis sempervirens* (L.) Pers., *Mimulus ringens* L., *Campanula aparinoides* Pursh, and *Prenanthes altissima* L. *Anacharis occidentalis* (Pursh) Victorin and *Lemna minor* L. were apparently recent introductions and both seem to have disappeared, although it is not unlikely that they grew in the Arboretum area before and that they may reappear.

The Arboretum affords unusual opportunities for the introduction of exotic plants because of the varied and almost world-wide sources from which material is obtained. Seeds of weeds and other plants may be brought in with packing or soil about living material, or in seed, fertilizer or loam, and sometimes in rubbish that is dumped in certain places. The

[1] Jour. Arnold Arb. 11: 64–119. 1930.

[2] Ibid. 16: 81–98. 1935.

common agencies of birds and winds are also active. Many plants appear that are obviously only transient waifs and the source from which they come can in some cases be determined with reasonable certainty. Some waifs have been included in the lists when they seemed to be of sufficient interest, but a number of others of which specimens have been made for a record have been excluded. It is difficult to know where to draw a line in such cases; but in general plants that are almost certainly transient and that are of known origin have been excluded. Most of these appear on rubbish dumps, and they include such garden vegetables as maize, potato, pumpkin, beans, and spinach. Among other less common plants are species known to have been under investigation or to have been used experimentally by members of the staff of the Arnold Arboretum or of the Bussey Institution. A few others have been collected that have persisted from old gardens but which show no tendency to spread. Specimens of most of these may be found in the special herbarium of SPONTANEOUS PLANTS. All of the collections reported in this list and the numbers shown are those of the author, except as otherwise specified.

It is the intention of this paper, as was the case with the previous ones, to employ plant names approved by the latest usage. But so many changes have been made in recent publications in the interpretation of names and in the acceptance of earlier names for many species that the nomenclature of the earlier papers is in need of revision. Perhaps someday it will be possible to bring together and to revise all of the lists.

Thanks are due to Dr. L. H. Bailey for identifying most of the species of *Rubus* and to Dr. S. F. Blake and others for verifying or supplying determinations of a few plants in other difficult groups.

ENUMERATION OF THE ADDITIONAL PLANTS COLLECTED[1]

Anacharis occidentalis (Pursh) Victorin. Water-weed. Shallow water and muddy margins of pond, South Street tract. No. 44701. Abundant and in flower in 1938, but not seen since.

**Bromus arvensis* L. Field Chess. Dry open banks north of Administration Building. No. 46002.

**Festuca elatior* L. var. *arundinacea* (Schreb.) Wimm. Gravelly bed of Bussey Brook, South Street tract. No. 46689.

Festuca rubra L. f. *prolifera* (Piper) Fernald. Open grassy slopes, Lilac group. No. 42856.

Poa nemoralis L. Open grassy ground near Dawson House. No. 42857.

**Poa trivialis* L. Waste ground, old quarry along Bussey Street. No. 43161.

Eragrostis Frankii (Fisch., Mey. & Lall.) Steud. Meadow near Celtis group. No. 39666.

**Eragrostis pilosa* (L.) Beauv. Waste and cultivated ground. No. 42973.

[1] Introduced plants are marked by an asterisk (*).

**Eleusine indica* Gaertn. Goose Grass. Waste ground, old quarry along Bussey Street and along path near Cercidiphyllum group. Nos. 40221, 46858.

Glyceria pallida (Torr.) Trin. var. *Fernaldii* Hitchc. Border of pond near Forest Hills gate. No. 28155.

Deschampsia flexuosa (L.) Trin. Hair Grass. On conglomerate outcrops and in dry gravelly soil, top of Hemlock Hill, Central Woods, and in Malus group, base of Peters Hill. Nos. 42842, 46169. Very local.

Agrostis stolonifera L. var. *compacta* Hartm. Creeping Bent Grass. Muddy margins of brook near Arborway wall southeast of Administration Building. Nos. 45248, 46160, 46674.

**Agrostis alba* var. *vulgaris* (With.) Thurb. Wet margins of small pond above Fraxinus group. No. 46672.

Alopecurus geniculatus L. Water Foxtail. In shallow water along margin of brook near Arborway wall. Nos. 45427, 46677.

**Alopecurus carolinianus* Walt. Southern Foxtail. Moist cultivated ground, south of Hemlock Hill. No. 45960.

Spartina pectinata Bosc ex Link. Prairie Cordgrass. Moist open ground along brook near Jamaica Plain gate. No. 44694. A large clump, seldom flowering.

Panicum agrostoides Spreng. Wet open ground, low meadow near Administration Building. No. 46535. Uncommon.

Panicum clandestinum L. Bank along road near Robinia group. No. 46694.

Panicum dichotomiflorum Michx. var. *geniculatum* (Wood) Fernald. Waste and cultivated ground. Nos. 38229, 43097.

**Setaria Faberii* Herrm. Rich waste ground, old quarry along Bussey Street. No. 47074.

Andropogon scoparius Michx. (*A. scoparius* var. *villossisimus* Kearney ex Scribn. & Ball). Dry open ground, Peters Hill. No. 44689. Uncommon.

Cyperus strigosus L. var. *capitatus* Boeckl. South Street nursery. No. 43408.

Eleocharis ovata (Roth.) R. & S. Muddy margin of pond. No. 35152.

Eleocharis capitata (L.) R. Br. var. *borealis* Svenson. Springy ground, south side of Peters Hill and along ditch in low meadow. Nos. 45974, 46007.

Scirpus planifolius Muhl. Dry open woods, top of Hemlock Hill. Nos. 45966a, 46010. Rare and local.

Scirpus expansus Fernald. Along drainage ditch, low meadow near Administration Building. No. 43408.

Scirpus atrovirens Muhl. var. *georgianus* (Harper) Fernald. Margins of brook near Arborway wall. No. 45218.

Carex scoparius Schkuhr var. *moniliformis* Tuckerm. Wet springy ground, southeast side of Peters Hill. No. 40293.

Carex tribuloides Wahlenb. var. *reducta* Bailey. Wet open ground, low meadow near Administration Building. No. 46006.

Carex cephalantha (Bailey) Bicknell. Wet ground about spring, southeast side of Peters Hill. Nos. 27976, 37723, 42599. Reported in the original list as *C. echinata* Murr.

Carex canescens L. Wet ground along brook north of Administration Building. No. 40038.

Carex virescens Muhl. Rocky slopes, south side of Hemlock Hill. No. 42833.

Carex aestivalis M. A. Curtis. Rocky slopes, south side of Hemlock Hill. No. 42832. Rare and local.

Carex laxiculmis Schwein. Open woods, Oak group. No. 42838. Uncommon.

Carex hystericina Muhl. Along ditch, low meadow near Administration Building. No. 46645.

Symplocarpus foetidus (L.) Nutt. Skunk Cabbage. Wet ground in a number of places throughout the Arboretum. This interesting plant, one of the first to bloom in spring, was referred to in former papers, but through oversight it was omitted from the list.

Lemna minor L. Small Duckweed. Stagnant pools along brook near Arborway wall. No. 46381. Transient.

Juncus dichotomus Ell. var. *platyphyllus* Wiegand. Open ground, low meadow near Administration Building, and in cultivated ground, South Street tract. Nos. 45666, 46557.

Juncus tenuis Willd. var. *anthelatus* Wiegand. Open ground, top of Hemlock Hill. No. 46692.

**Muscari botryoides* (L.) Mill. Grape Hyacinth. Grassy bank, Populus group, South Street tract. No. 44721. Well established.

**Iris Pseudacorus* L. var. *pallida* Hort. ex Bailey. Pale Yellow Iris. This form with very pale flowers is found in the low meadow near the Administration Building. No. 45894.

Salix discolor Muhl. var. *eriocephala* (Michx.) Anders. Wet open ground, low meadow near Administration Building. No. 46594.

Betula papyrifera Marsh. Paper Birch. Open woods, top of Peters Hill. No. 37755.

Celtis occidentalis L. Hackberry. Top of Hemlock Hill. No. 46369. Probably introduced here.

**Morus alba* L. White Mulberry. Waste ground, South Street tract. No. 43169.

**Rumex triangulivalvis* (Danser) Rech. f. (*R. mexicanus* of auth., not Meisn.). Along brook and about pond, South Street tract. No. 43173.

Polygonum aviculare L. var. *angustissimum* Meisn. Waste open ground. No. 44694a.

Polygonum aviculare var. *arenastrum* (Bor.) Rouy. Waste open ground. No. 44693a.

**Polygonum caespitosum* Blume var. *longisetum* (DeBruyn) Steward. A weed in waste ground. No. 46382, S. F. Blake & E. J. Palmer.

**Polygonum Bistorta* L. Bistorte, Snakeweed. A large colony near the bridle path in Conifer group. No. 46620.

**Chenopodium Botrys* L. Jerusalem Oak. Waste ground and rubbish dumps, about foundation of old Bussey mansion. Nos. 46649, 47073.

**Chenopodium glaucum* L. Oak-leaved Goosefoot. Along drainage ditch, low meadow near Administration Building. No. 42970.

**Chenopodium paganum* Reichenb. Lamb's Quarters. Waste ground, old quarry along Bussey Street. No. 46086.

Chenopodium hybridum L. Maple-leaved Goosefoot. Waste ground about foundation of old Bussey mansion. No. 47072.

Atriplex patula L. Orach. Waste and cultivated ground. Nos. 43078, 47939. Not common but apparently spreading.

**Axyris amaranthoides* L. Rocky waste ground, old quarry along Bussey Street. No. 46980. Probably only a transient weed.

**Amaranthus hybridus* L. Amaranth, Pigweed. Waste ground, South Street tract. No. 43083.

**Amaranthus hybridus* f. *hypochondriacus* (L.) Robinson. Prince's Feather. A weed in waste ground, old quarry along Bussey Street. No. 45249.

Anychia canadensis (L.) B. S. P. Forked Chickweed. Open wooded hillside, North Woods, near Robinia group. No. 45214. Rare and local.

**Arenaria serpyllifolia* L. Thyme-leaved Sandwort. A weed in cultivated ground. Nos. 43081, 44783.

**Agrostemma Githago* L. Corn Cockle. Waste ground, old quarry along Bussey Street. No. 43007. Probably only a transient waif.

**Silene Armeria* L. Sweet William Catchfly. Grassy border near Administration Building. No. 42688. Probably a transient waif.

Clematis virginiana L. Virgin's Bower. In tangle of shrubs along Meadow Road. No. 44912. Probably escaped from cultivation.

Menispermum canadense L. Moonseed. Among weeds and shrubs, Juglans group. No. 36535a. Probably escaped from cultivation.

**Eschscholtzia californica* Cham. California Poppy. On open bank near Administration Building. No. 44884. Escaped from cultivation.

Corydalis sempervirens (L.) Pers. Pink-flowered Corydalis. At foot of conglomerate ledge, top of Hemlock Hill. No. 46183. Rare and local.

**Brassica campestris* L. Rutabaga. A weed in waste ground near Administration Building. No. 44313.

**Brassica juncea* (L.) Cosson. Indian Mustard. Waste ground, old quarry along Bussey Street. No. 47010.

**Ribes rubrum* L. Red Currant. Moist ground, thickets near Pterocarya group. No. 44767.

**Spiraea japonica* L. f. Japanese Spiraea. Along margin of Bussey Brook near stone bridge. Nos. 46274, 47746.

**Malus micromalus* Mak. Rocky ground, old quarry along Bussey Street. No. 42697.

Sorbus americana Marsh. American Mountain Ash. Rocky open ground, top of Hemlock Hill. No. 46368. Probably escaped.

Aronia floribunda Spach. Chokeberry. Open rocky ground, top of Hemlock Hill. No. 46866. Introduced here.

Aronia prunifolia (Marsh.) Rehder. Wet ground about spring, south side of Peters Hill. No. 46977. Perhaps native.

**Potentilla intermedia* L. Dry open ground, South Street tract. No. 42820.

**Rosa suffulta* Greene. Among weeds and shrubs, Oak group. No. 39664.

Rubus idaeus L. var. *canadensis* Richards. Red Raspberry. Low meadow opposite Aesculus group. No. 45253a.

Rubus alius Bailey. Open ground, slopes of Bussey Hill. No. 46612.

Rubus semisetosus Blanchard. Open woods near top of Peters Hill. No. 46693.

Rubus rhodinsulanus Bailey. Open woods and thickets, Peters Hill. Nos. 43422, 43529.

Rubus novanglicus Bailey. Thickets and rocky open ground. Nos. 44356, 44361.

Rubus permixtus Blanchard. Rocky ground, top of Hemlock Hill. No. 46016.

Rubus frondosus Bigel. "Overlook," C. E. Faxon. 1919.

Rubus multiformis Blanchard. C. E. Faxon. 1913.

Rubus philadelphicus Blanchard. Rocky ground, Central Woods. No. 46653.

Rubus Rosa Bailey. Low meadow opposite Aesculus group. Nos. 45248, 46613.

**Rubus laciniatus* Willd. Persistent from cultivation, near site of old Bussey mansion. No. 46662.

Prunus pennsylvanica L. f. Pin Cherry. Rocky ground, top of Hemlock Hill. No. 45962.

**Medicago sativa* L. Alfalfa. Waste ground, South Street tract. No. 43166.

**Astragalus glaucophyllus* Bunge. Grassy bank near Bussey greenhouse. No. 44324.

Desmodium Dillenii Darl. Tick Trefoil, Stick-tight. Border of pond near Forest Hills gate.

Lespedeza capitata Michx. Dry open ground, edge of woods, south side of Peters Hill. No. 43526.

Lespedeza capitata × *hirta*. Plants that appear to be this hybrid were found growing with the supposed parent species on the south side of Peters Hill. No. 43526a.

**Oxalis corniculata* L. (*O. repens* of auth.). On base of rotting stump, near pond and Robinia group. No. 47127.

Zanthoxylum americanum Mill. Prickly Ash. Thickets, rocky ground on top of Hemlock Hill. No. 46419. Probably introduced from cultivated plants.

**Euphorbia maculata* L. (*E. Preslii* Guss.). Waste ground about foundation of old Bussey mansion. No. 46957. A recent introduction, but apparently spreading. The plant reported under this name in the original list is now known as *Euphorbia supina* Raf.

**Euphorbia virgata* Waldst. & Kit. Under trees, Conifer group. Leon Croizat. 1938.

Vitis riparia Michx. (*V. vulpina* of auth., not L.). River-bank Grape. Slopes of Peters Hill, Crataegus group, and in Conifer group. Climbing on trees and shrubs. Nos. 45669, 46562. No doubt introduced from cultivated plants.

Vitis aestivalis Michx. Summer Grape. Thickets, bank near Robinia group. No. 46695. Probably introduced.

**Viola blanda* Willd. Waste ground, old quarry along Bussey Street. No. 44726.

×*Viola abundans* House (*V. fimbriatula* × *sagittata*). Moist meadow, Maple group. No. 42810.

×*Viola aberrans* Greene (*V. fimbriatula* × *papilionacea*). Nos. 36407, 42682.

Viola fimbriatula × *scabriuscula*. Grassy open ground near base of Peters Hill. No. 40023.

Viola lanceolata × *sagittata*. Grassy open ground, Crataegus group, near base of Peters Hill. No. 42816a.

**Elaeagnus umbellata* Thunb. Oleaster. Thickets and waste ground. No. 46972. Frequently escaped and becoming abundant.

Oenothera laciniata Hill. Waste ground, fertile soil, near Dawson House. No. 42856.

Rhododendron viscosum (L.) Torr. White Swamp Azalea. Low ground along Bussey Brook, Conifer group. No. 39603. Plants coming up after persistent mowing, and probably native.

**Fraxinus pennsylvanica* Marsh. var. *lanceolata* (Borkh.) Sarg. Green Ash. On rubbish dump, South Street tract. No. 43519. Introduced here and probably not native in the Arboretum.

**Ipomoea purpurea* (L.) Roth. Purple Morning Glory. On rubbish dump, South Street tract. No. 43072.

Cuscuta pentagona Engelm. (*C. arvensis* Beyrich). Field Dodder. Along border of Bussey Brook, growing on tall herbs. No. 46400.

**Lithospermum arvense* L. Corn Gromwell. In cultivated bed near Administration Building. No. 44312. Transient.

**Physostegia virginiana* L. False Dragon Head. Waste ground, border of pond, South Street tract. No. 44700. Transient.

Lycopus virginicus L. Moist fertile ground at foot of Hemlock Hill and along brook. Nos. 28245, 46372.

**Mentha piperita* L. Peppermint. Waste ground near pond, South Street tract. No. 47260.

Prunella vulgaris L. var. *lanceolata* (Bart.) Fernald. Wet ground about spring, southeast side of Peters Hill. No. 44685.

**Solanum carolinense* L. Horse Nettle. Waste ground, old quarry along Bussey Street. No. 45212. Persistent and spreading for several years.

**Lycium halimifolium* Mill. Matrimony Vine. Rocky banks and waste ground. No. 38174. Escaped from cultivation.

Mimulus ringens L. Monkey Flower. Along drainage ditch, low meadow, and margins of Bussey Brook near Bussey Street. Nos. 43418, 46362.

Gratiola neglecta Torr. (*G. virginiana* of auth., not. L.). Hedge Hyssop. Muddy margins of pond, South Street tract. No. 42997.

**Veronica arvensis* L. Corn Speedwell. Cultivated and waste ground. Nos. 42997, 43117. Not common.

**Galium Mollugo* L. A weed in cultivated beds. Nos. 44716, 46378, 46408a.

**Galium Aparine* L. var. *Vaillantii* (DC.) K. Koch. Grassy open ground, Conifer group. Nos. 45986, 46167.

Galium palustre L. Wet ground along margins of Bussey Brook. Nos. 42836, 45983.

Viburnum cassinoides L. Withe-rod, Wild Raisin. Open woods, Central Woods, and top of Hemlock Hill. Nos. 45516, 46867.

Viburnum recognitum Fernald. (*V. dentatum* of auth., not. L.). Arrow-wood. Thickets, rocky ground on top of Hemlock Hill. No. 46602.

**Viburnum Opulus* L. Cranberry-tree. Wet ground, south side of Peters Hill. No. 46975.

Campanula aparinoides Pursh. Marsh. Bluebell. In wet grassy and weedy ground, southeast side of Peters Hill. Nos. 45502, 46363. Very local.

**Liatris spicata* (L.) Willd. Blazing Star. Rocky waste ground, old quarry along Bussey Street. Nos. 42972, 42975.

Solidago gigantea Ait. var. *leiophylla* Fernald. (*S. serotina* Ait.) Smooth Golden-rod. Along margins of Bussey Brook near stone bridge. No. 47421. Rare.

Solidago altissima L. Tall Golden-rod. Open ground, south side of Peters Hill. No. 47113.

Solidago bicolor L. var. *lutea* Farwell. Dry open slopes of Peters Hill. No. 47937. Rays bright yellow.

Solidago canadensis × *juncea*. Dry open ground, south side of Peters Hill. No. 47937.

Solidago canadensis × *rugosa*. Open ground near Walter Street nursery. No. 47085.

Solidago juncea × *puberula*. Open ground near top of Peters Hill. No. 36387.

Aster novi-belgii × *vimineus*. Open springy ground, southeast side of Peters Hill. No. 46546. Growing with supposed parent species.

Aster lateriflorus × *paniculatus*. Border of low meadow, near Rhus group. No. 46967.

Erigeron pulchellus Michx. Robin's Plantain. Moist grassy ground, Peters Hill and near Arborway wall. Nos. 36387, 36415.

**Xanthium pennsylvanicum* Wallr. Cocklebur. Waste ground about pond, South Street tract. No. 46551.

**Helianthus petiolaris* L. Sunflower. South Street nursery. No. 44698.

**Helianthus doronicoides* Lam. Open woods, Oak group. Nos. 42978, 43084.

**Coreopsis major* Walt. var. *stellata* (Nutt.) Robinson. Among tall herbs and shrubs, Juglans group, and near Dawson nursery. Nos. 25885, 47239a.

Bidens vulgata Greene var. *puberula* (Wiegand) Greene. As a weed in cultivated ground, Deutzia beds. No. 46412.

**Cosmos bipinnatus* Cav. Cosmos. Waste ground, old quarry along Bussey Street. No. 43521. Probably only a transient waif.

**Helenium autumnale* L. Autumn Sneezeweed. Open grassy bank east of Administration Building. No. 45611.

**Matricaria matricarioides* (Less.) Porter. Pineapple-weed. Waste and cultivated ground. No. 46176.

**Chrysanthemum Parthenium* (L.) Bernh. Feverfew. Bank near Administration Building. No. 44913.

**Doronicum Pardalianches* L. Leopard's Bane. Open ground along bridle path, near Centre Street gate. Nos. 43115, 47171.

**Cichorium Intybus* L. f. *album* Farwell. Dry open ground, Peters Hill. No. 44690.

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

NOTES ON A NUMBER OF NEW GUINEAN SPECIES*

C. G. G. J. van Steenis

APONOGETONACEAE

Aponogeton loriae Martelli in Nuovo Giorn. Bot. Ital. ser. *2*, 3: 472, *pl. 8*. 1897.

British New Guinea: Central Division: Kubuna, *L. J. Brass 5567*, Nov. 1933, alt. 100 m., common in shallow, stony streams in forest, leaves brown, completely submerged, spikes of greenish yellow flowers protruding just above the water. Western Division: Penzara, between Morehead and Wassi Kussa Rivers, *L. J. Brass 8671*, Dec. 1936, in stream in savanna forest.

The New Guinean specimens have sometimes been referred to *A. crispus* Thunb. by F. v. Mueller (Descr. Not. Pap. Pl. 2: 51. 1886), and to *A. monostachyum* L. f. by Hemsley (Kew Bull. 113. 1899), but they differ from both species in their greenish yellow flowers and the persistent spathe gradually decaying from the apex to the base. The leaves, for the most part, gradually taper into the petiole. This Papuan species is also known from the southern Celebes, and possibly occurs also in Queensland.

JUNCAGINACEAE

Triglochin procera R. Br. var. **dubia** Benth. Fl. Austral. 7: 168. 1878; Buchenau in Pflanzenr. 16(IV.14): 14. 1903.

British New Guinea: Western Division: Penzara, between Morehead and Wassi Kussa Rivers, *Brass 8447*, Dec. 1936, savanna forest, common in streams which contain water only during the wet season; Tarara, Wassi Kussa River, *Brass 8666*, Jan. 1937, savanna forest, massed in a small stream, dry during the dry season. Plant about 50 cm. high; roots swollen into terminal tubers; leaves about 2 mm. broad; carpels free.

The first record of the genus within Malaysia, the species and a variety also known from Australia and Tasmania.

PONTEDERIACEAE

Monochoria hastata (L.) Solms in DC. Monog. Phan. 4: 523. 1883.
Pontederia hastata L. Mant. Pl. 362. 1771.

Northeast New Guinea: Morobe District, vicinity of Kajabit Mission, *Mrs. M. S. Clemens 10636*, Aug.-Dec. 1939, alt. 240–600 m.

Distribution: From India to S. China and throughout Malaysia; as yet not reported from Queensland.

PHILYDRACEAE

Helmholtzia novoguineensis (Krause) Skottsberg in Bot. Jahrb. 65: 260. 1932; Bull. Jard. Bot. Buitenz. III. 13: 112. 1933.
Xerotidae sp., Teijsmann in Natuurk. Tijdschr. Ned. Ind. 37: 132. 1877.
Astelia novoguineensis Krause in Bot. Jahrb. 59: 559. 1924.

* Results of the Richard Archbold Expeditions.

NETHERLANDS NEW GUINEA: Idenburg River, 4 km. SW. of Bernhard Camp, *L. J. Brass 13431*, Mar. 1939, alt. 850 m., rare in rain forest ravines (flowers and fruit white); same locality, 6 km. SW. of Bernhard Camp, *L. J. Brass 12859*, Feb. 1939, alt. 1150 m., occasional in undergrowth of rain forest ravine (flowers and fruit white).

DISTRIBUTION: New Guinea and Moluccas (Ambon, Buru, Ceram); another species in Australia.

Philydrum lanuginosum Banks ex Gaertn. Fruct. 1: 62. 1788.

BRITISH NEW GUINEA: Lower Fly River, Gaima, east bank, savanna areas, *L. J. Brass 8353*, Nov. 1936, common in sedge stands in shallow swamps (flowers yellow); Western Division, Dagwa, Oriomo River, *L. J. Brass 6002*, Febr.–March 1934, common on fringes of small savanna swamps (flowers yellow).

DISTRIBUTION: From SE. and E. Asia to Australia, but within Malaysia hitherto only found in the Malay Peninsula. The record from Java on the basis of a Hillebrand specimen is doubtless due to an error in the locality, and Merrill (Philip. Jour. Sci. 10, Bot.: 88. 1915) showed that the Philippine record also was based on an erroneously localized collection. This is the first record of its occurrence in New Guinea.

Both members of this family here recorded were easily identified through Skottsberg's excellent revision in Bull. Jard. Bot. Buitenz. III. 13: 110–113. 1933.

HAEMODORACEAE

Haemodorum coccineum R. Br. Prodr. 300. 1810; F. v. Mueller Descr. Not. Pap. Pl. 2: 67. 1890.

BRITISH NEW GUINEA: Tarara, Wassi Kussa River, *L. J. Brass 8384*, Dec. 1936, savanna forest, common on sour gray clay soil flats (rootstock red inside; flowers red).

The genus was hitherto known only from Australia, but F. von Mueller mentioned it nearly sixty years ago as occurring on the Wassi Kussa River without indicating the collector.

DROSERACEAE

Drosera indica L. Sp. Pl. 282. 1753.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *L. J. Brass 7827*, Sept. 1936, common in thick cover on wet grass-plains (flowers purple).

Drosera petiolaris R. Br. ex DC. Prodr. 1: 318. 1824.

BRITISH NEW GUINEA: Western Division, Wassi Kussa River, near Tarara, *L. J. Brass 8386*, Dec. 1936, on wet sandy flats (one of the first herbs to flower; flowers pink).

Drosera ? spathulata Labill. Nov. Holl. Pl. 1: 79, *pl. 106, f. 1*. 1804; Diels, Pflanzenr. 26(IV.112): 83. 1906.

BRITISH NEW GUINEA: Wassi Kussa River, Tarara, *L. J. Brass 8752a*, Jan. 1937, on wet ground in savanna forest (rare herb; flowers white).

This specimen was found in a cover with *L. J. Brass 8752* and separated at Buitenzorg. The dimensions of the three styles, which are bifid to the base, do not agree with Diels's description. The "normal" habitat in Malaysia for this species is found at medium or high altitudes; whereas,

D. burmannii Vahl (*L. J. Brass 5962*) occurs at low altitudes. In Australia, however, e.g. Queensland, *D. spathulata* Labill. also is found at low altitudes. It may be that this Papuan strain corresponds to the Queensland material. The type was collected at low altitude in Australia.

PODOSTEMONACEAE

Torrenticola queenslandica Domin in Bibl. Bot. 89[2]: 149, *pl. 35, fig. 7–13.* 1925; Engler, Nat. Pflanzenfam. II. 18a: 484. 1930.
Podostemon queenslandicus Domin l.c. nom. altern.

British New Guinea: Port Moresby area, Roona, *C. E. Carr 12415*, July 29, 1935, about 700 m. alt., on submerged rocks in the Laloki River (plant dark green; fruit brown).

As far as I know this is the second collection of the species, and the first record of the occurrence of the family in New Guinea. The material is in the same advanced stage of growth as the original collection, but flowers are needed for any further remarks on its exact affinity. It exactly matches the figure of the type-collection.

The only previous record of this family in New Guinea was made by Zippel (Flora 12: 285. 1829; Alg. Konst- & Letterbode 1: 297. 1829) of *Lemnopsis mnioides* Zipp. According to Hallier f. (Meded. Rijksherb. Leiden) this is an *Utricularia*. In 1947 I could not trace the specimen in the Leyden Herbarium.

H. J. Lam (Blumea 2: 117. 1936) cited a passage from d'Albertis's "New Guinea: What I did and what I saw" 2: 93. 1880, relating to a peculiar plant which d'Albertis found June 17, 1876. "It grows on the heaps of stones that abound in the river, and seen from a certain distance, its dark color, almost black, and its peculiar shape make it resemble the scales of a serpent. Its branches lie flat, so as to offer as little resistance as possible to the water. It owes to this curious conformation its power of resisting the strength of the current." According to my wife's MS. cyclopedia of Malaysian collectors this must have been on the Fly River which d'Albertis ascended from May 22 till June 25, 1876. If the plant was *Torrenticola* the vegetative phase must have resembled the scales of a serpent. The tiny flowering stems cannot have been meant as one cannot see these "from a distance" separately. Another argument against identifying d'Albertis's plant as a representative of the Podostemonaceae is the fact that Brass explored the Fly River area, and has, to my knowledge, collected nothing of the kind.

CORYNOCARPACEAE

Corynocarpus australasica C. T. White, Contr. Arnold Arb. 4: 57. 1933.

Netherlands New Guinea: SW. New Guinea, Zwaluw bivak, *Branderhorst 428*, June 10, 1908 (shrub with immature flowers); id. Tuinweg near Kp. Kabatiel, *Branderhorst 271*, Dec. 6, 1907 (tree with fruit).

Both numbers were unidentified specimens in Herb. Bog., which undoubtedly belong to this Papuan-Queensland tree-species. It seems that

Beguin has collected a new species of the genus in Halmaheira (Moluccas).

STACKHOUSIACEAE

Stackhousia intermedia F. M. Bailey in Queensl. Agric. Jour. 3(4): 174. 1898; Brouwer in Blumea 3: 174. 1938.

BRITISH NEW GUINEA: Western Division: Mabaduan, *L. J. Brass 6519*, April 1936, common grass associate in savanna forests (flowers and fruit yellow); Wassi Kuasa River, Tarara, *L. J. Brass 8661*, Jan. 1937, common in savanna forests (flowers brown-green); Wuroi, Oriomo River, *L. J. Brass 6072*, Jan.-March 1934, alt. 30 m.; same locality and date, *L. J. Brass 5760*, alt. 10–30 m., sporadic and rather uncommon on savanna.

DISTRIBUTION: From Sumatra through Malaysia and the Philippines to North Queensland and Micronesia.

SAPINDACEAE

Sarcopteryx coriacea Radlk. Sapind. Holl.-Ind. 98. 1878.

NETHERLANDS NEW GUINEA: Arfak Mountains, Angi Lakes, by ♀ lake, *L. S. Gibbs 5531*, alt. 2100 m. (small tree; fruit red).

The material consisting of a duplicate from the Brit. Mus. Herb. exactly matches the other collections mentioned by Radlkofer. Neither Gibbs nor Radlkofer cited this number; it was inserted in Herb. Bog. as *Euonymus* sp.

BOMBACACEAE

Papuodendron lepidotum C. T. White in Jour. Arnold Arb. 28: 272, *pl. 1*. 1946.

NORTHEAST NEW GUINEA: between Umbili and Wobbe, *R. Schlechter 16334*, July 30, 1907, alt. 300–400 m.

This specimen, which was provisionally identified as a new species of *Cumingia* by Ulbrich in the Berlin Herbarium, is the first known collection of White's new genus.

Camptostemon philippinensis (Vidal) Becc. Malesia 3: 273. 1889; Bakhuizen van den Brink in Bull. Jard. Bot. Buitenz. III. 6: 219, 245. 1924; Troll in Flora n. ser. 28: 350. 1933.

Cumingia philippinensis Vidal Phan. Cuming. Philip. 212, *pl. 1*. 1885.

BRITISH NEW GUINEA: Western Division: Tarara, Wassi Kussa River, *L. J. Brass 8517*, Dec. 1936, common in mangroves (tree; flowers white); Mabaduan, *L. J. Brass 6475*, April 1936, very common mangrove tree, sometimes forming nearly pure forest (25 m. high, lower part of trunk fluted; bark ± scaly, reddish brown when cut; very numerous large flattened brown knobby pneumatophores).

Known from the Philippines, Borneo, the Moluccas, and North Australia; first record from New Guinea.

STYRACACEAE

Bruinsmia styracoides Boerl. & Koord. in Natuurk. Tijdschr. Ned. Ind. 53: 68. 1893.

NETHERLANDS NEW GUINEA: 2 km. SW. of Bernhard Camp, Idenburg River, *Brass & Versteegh 13506*, April 1939, alt. 700 m., frequent on slopes of primary forest (tree 20 m. high). NORTHEAST NEW GUINEA: Morobe District, Yunzaing, *Mrs. M. S. Clemens 2970*, April 1936, alt. 1500 m., forested hills.

DISTRIBUTION: From Sumatra to New Guinea, but hitherto in the latter island only reported from the southeast part, the record being based on a Forbes specimen.

Styrax agrestis (Lour.) G. Don, Gen. Hist. 4: 5. 1837.

NETHERLANDS NEW GUINEA: Idenburg River, Bernhard Camp, *L. J. Brass 13953*, April 1939, alt. 50 m., common in flooded perhaps permanently swampy rain forest of river plains (straggling tree attaining 12 m.; flowers white); same place and date, *L. J. Brass 13820*, swampy rain forest (shrub ± 4 m. high). BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *L. J. Brass 7565*, Aug. 1936, common in brushy outskirts of lake shore rain forest (slender virgate tree 4–5 m. high). NORTHEAST NEW GUINEA: Morobe District, Yoangen to Mongi, *Mrs. M. S. Clemens 6613*, June 1937, alt. about 1000 m.

The species is distributed very widely, from Annam and Hainan through Borneo, Celebes, and the Moluccas to New Guinea, the Bismarcks, the Solomons, and Micronesia. Hitherto it was only reported from the northern parts of New Guinea. It seems to be exceedingly variable in habit, and very tolerant as to habitat.

SYMPLOCACEAE

Symplocos confusa Brand, Pflanzenr. 6(IV.242): 88. 1901.

NETHERLANDS NEW GUINEA: 9 km. NE. of Lake Habbema, *Brass & Versteegh 10492*, Oct. 1938, alt. 2600 m., rare (tree 20 m. high, 45 cm. diameter, crown not wide-spreading; bark 13 mm. thick, smooth; wood yellow-brown).

A widely distributed species, described under various names, known from SE. Asia (Ceylon to Luchu Islands) through Malaysia to New Guinea.

BIGNONIACEAE

Neosepicaea viticoides Diels in Bot. Jahrb. 57: 500, *fig. 1*. 1922.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *L. J. Brass 7580*, Aug. 1936, abundant in rain forests (large canopy liane; corolla brown outside, purple within; [leaflets 3–4;] terminal panicle with young foliage); Lower Fly River, east bank, opposite Sturt Island, *L. J. Brass 7994*, Oct. 1936, in rain forest (high climbing liane; flowers streaked brown; [always 3 leaflets]). NORTHEAST NEW GUINEA: Kaiser Wilhelmsland, Djamu River, *R. Schlechter 17557*, April 1908, about 250 m. alt., liane in the forest.

Schlechter's collection is the first ever made of this species. In preliminary work this plant was identified as a member of the Verbenaceae, and I found Schlechter's number among the latter family inserted under a provisional name. The species was originally described by Diels as having 5–7 leaflets, but the Brass collections have only 3–4. The petiolule of the terminal leaflet is of the same length as those of the lateral ones and, hence, the leaf is digitately compound.

BOTANIC GARDENS,
BUITENZORG, JAVA.

ENDLICHER'S "GENERA PLANTARUM," "ICONOGRAPHIA GENERUM PLANTARUM" AND "ATAKTA BOTANIKA"

WILLIAM T. STEARN

THE MOST IMPORTANT botanical work of the Austrian scholar Stephan Ladislaus Endlicher (1804–49) is probably his *Generum Plantarum secundum Ordines naturales disposita* (quarto, Vienna) which was published in 18 parts between 1836 and 1841. It describes about 7,200 genera, 40 of these being new genera proposed by Endlicher, and was the most detailed and comprehensive survey of the vegetable kingdom available until the publication of Bentham and Hooker's *Genera Plantarum* (1862–83). Its arrangement, as pointed out by Jessen, *Botanik der Gegenwart und Vorzeit*, 428. 1864, owes much to the earlier works of Jussieu, Bartling and Unger, but the descriptions, synonymy etc. were the result of Endlicher's own immense erudition and industry. Many of the genera are subdivided into sections. It is on account of the sectional names published here and often overlooked by later botanists that the work retains its reference value, and the dates of their publication are accordingly important.

A very useful account of a copy of the *Genera* having most of its original wrappers preserved was given by E. Migliorato-Garavini in *Annali di Botanica* (Roma) 3: 169–175. 1905 and supplemented in op. cit. 22: 44–45. 1941. There is also a short note on its publication in *Catalogue Books British Museum* (*Nat. Hist.*) 2: 529. 1904. Both, however, leave various points in doubt. The Lindley Library of the Royal Horticultural Society possesses a copy containing part of the original wrappers. Brockhaus, *Allgemeine Bibliographie für Deutschland* (Leipzig) listed the contents of the parts as they were received at Leipzig, and other contemporary references to the work are to be found in the *Verzeichnis neuer Bücher* of the Leipzig bookseller J. C. Hinrichs and the botanical periodical *Flora* (Regensburg). By correlating data from these sources the publication of Endlicher's **Genera Plantarum** becomes clearer and may be summarized as follows: —

Fascicle 1, pages 1–80, published probably Sept. 1836; fasc. 2, pp. 81–160, i–iv, publ. Dec. 1836; fasc. 3, pp. 161–240, publ. June 1837; fasc. 4, pp. 241–320, publ. Oct. 1837; fasc. 5, pp. 321–400, publ. Dec. 1837; fasc. 6 & 7, pp. 401–560, v–xii, publ. June 1838; fasc. 8, pp. 561–640, publ. Aug. 1838; fasc. 9, pp. 637–720, xiii–xvi, publ. Jan. 1839; fasc. 10, pp. 721–800, publ. March 1839; fasc. 11, pp. 801–880, publ. June 1839; fasc. 12, pp. 881–960, xvii–xx, publ. Nov. 1839; fasc. 13, pp. 961–1040, publ. Feb. 1840; fasc. 14, pp. 1041–1120, publ. April 1840; fasc. 15, pp. 1121–1200, publ. June 1840; fasc. 16, pp. 1201–1280, xxi–xxviii, publ. Aug. 1840; fasc. 17, pp. 1281–1360, xxix–xl, publ. Oct. 1840; fasc. 18, pp. 1361–1483, xli–lx, title, dedication, preface, publ. prob. Feb.-Mar. 1841.

The parts appear to have been received at Regensburg and Leipzig a month or two later than the months stated on the wrappers and accepted above, transport in central Europe being very slow before the building of railways. Thus the first part seems to have been dated "20 Aug. 1836" but the earliest notices of it are in *Allgemeine Bibliographie* 1836: 752. 4 Nov. 1836, *Literarische Zeitung* 3: 877. 9 Nov. 1836, *Börsenblatt* 1836 (no. 45): 45. Nov. 1836; probably it appeared in September 1836. Migliorati was under the impression that the work may have consisted of 19 parts. It is, however, certain from the notices in *Allgemeine Bibliographie* 1841 (17): 171. 23 April 1841, Wikström, *Jahresber. Bot. 1839–42*: 2. 1846 and Hinrichs, *Verz. Büch. Jan.-Juni 1841*: 66. 1841 that the eighteenth part was the last and contained pages 1361–1483; as the preface is dated "Januar. MDCCCXXXXI," this part was probably published in February 1841. For corrections of the index, which occupies pp. 1429–1483 and contains about 17,500 names, see *Botanische Zeitung* 3: 301–306. 1845.

Five Supplements were published: —

(1) *Supplementum* I occupies pp. 1335–1427 of the main work and was issued in parts 17 and 18 (1840–41) of this. The others were separate publications.

(2) *Mantissa botanica, sistens Generum Plantarum Supplementum secundum*. 114 pages. 1842 (after March).

(3) *Mantissa botanica altera, sistens Generum Plantarum Supplementum tertium*. 11 pages. 1843 (after October 4).

(4) *Generum Plantarum Supplementum quartum, Pars II*. 96 pages. 1847 (according to title-page) or 1848.

(5) *Generum Plantarum Supplementum quintum*. 104 pages. 1850.

Pars 1 of *Supplementum IV* was never published. *Supplementum V* (or IV Pars 3) lacks a title-page and was completed by Eduard Fenzl after Endlicher's death. On the wrapper it is entitled "Supplementum Quintum" but the pages bear the heading "Supplementum IV Pars III."

The *Genera Plantarum* has no illustrations but these are provided in a companion work, Endlicher's *Iconographia Generum Plantarum* (quarto, Vienna) with engraved plates, mostly by Ferdinand Bauer and mostly illustrating Australian species; there are also some plates by Eduard Fenzl, Aloys Putterlinck and Josef Zehner. The number at the right-hand corner of the plate is that under which the genus illustrated is described in the *Genera*. The plate number is in the lower right-hand corner. The plates may thus be arranged as issued according to the plate numbers or re-arranged systematically by families according to the generic numbers. The Index (pp. xiv-xvi) correlates the two sets of numbers. The **Iconographia** was likewise published in parts, dated as follows:

Fascicle 1, plates 1–12, 1837; fasc. 2, pl. 13–24, 1837; fasc. 3, pl. 25–36, 1837; fasc. 4, pl. 37–48, title, dedication, pp. v viii, 1838; fasc. 5, pl. 49–60, 1838; fasc. 6, pl. 61–72, 1839; fasc. 7, pl. 73–84, 1839; fasc. 8, pl. 85–96, 1839; fasc. 9, pl. 97–108, 1840; fasc. 10, pl. 109–125, pp. ix–xvi, 1841.

Only four hitherto unpublished names appeared on the plates of the *Iconographia*, and of these *Litsea Baueri* Endl. op. cit. t. 44, 1838, p. x. 1841 alone concerned an undescribed species, collected by Bauer in Australia (Nova Hollandia). *Coprosma Baueri* Endl. op. cit. p. x, t. 111. 1841 was published as a new name for the Norfolk Island plant described in detail by Endlicher, *Prodr. Fl. Norfolk* 60, n. 117. 1833 as "*C. lucida* Forst.," while *Anoplanthus uniflorus* (L.) Endl. op. cit. t. 72. 1839; p. xii. 1941 and *Stirlingia anethifolia* (R. Br.) Endl. op. cit. t. 23. 1837; p. xi. 1841 were new combinations, as is made clear by the synonymy etc. in "Conspectus Dispositionis Tabularum" on pp. ix xiii; this also indicates the material from which the plates were drawn.

The quarto *Iconographia* was preceded by an illustrated folio work, *Atakta botanika. Nova Genera et Species Plantarum descripta et Iconibus illustrata*, which, despite the excellence of its large detailed plates, is bibliographically a most unsatisfactory work. The title-page is dated "MDCCCXXXIII" and there is nothing within the work itself to indicate that it was published in 5 parts between 1833 and 1835. Moreover it terminates abruptly in the middle of a word and lacks an index. The first two plates (illustrating *Diesingia scandens*) are without numbers; the last plate is numbered 40, but the work contains only 35 plates, for tt. 10, 26, 28, 37, 38 were never published. There is no text to tt. 27–40, although several of these figure undescribed species. The names on the plates are, however, validly published, despite the absence of descriptions, because the plates give detailed analyses of floral structure. The name *Atakta botanika*, chosen to indicate that the work was a botanical miscellany without any systematic or geographical order, is from the Greek ἄτακτος ('undisciplined, not in battle order, irregular') and proved all too appropriate! Endlicher wrote most of the text, but Fenzl contributed some descriptions. The plates are by Ferdinand Bauer, Endlicher, Fenzl, Franz Xavier, Fieber and Zehner. The publication of **Atakta botanika** is shown by contemporary references to have been as follows:

Contents	Publication Date	Authority
Fascicle 1 pp. 1–6, tt. 1–5	1833	cf. Hinrichs, Verz. Bücher July-Dec. 1833, p. 55; Wikström, Jahresb. Bot. 1833: 50. 1835.
Fascicle 2 pp. 7–12, tt. 6–11	1833 or 1834	cf. Hinrichs, Verz. Bücher July-Dec. 1834, p. 56; Wikström, Jahresb. Bot. 1834, p. 30. 1836.
Fascicle 3 pp. 13–20, tt. 12–24	1834	
Fascicle 4 pp. 21–26, tt. 25–40	1835	cf. Hinrichs, Verz. Bücher Jan.-Juni 1835, p. 54; Wikström, Jahresb. Bot. 1834; 53. 1836.

The following species are figured in this work: — *Alseis floribunda*, t. 33; *Anamirta Baueriana*, n. sp., tt. 39–40; *Brachystemma calycinum*, 18, t. 16; *Ceratotheca sesamoides*, 5, t. 5; *Dalechampia papposa*, n. sp., 22, tt. 20–21; *Deppea hedyotidea*, 25, t. 24; *Diesingia scandens*, 1, tt. 1–2; *Dodonaea hispidula*, n. sp. (= *Distichostemon hispidulum*), t. 30; *Dodonaea humilis*, n. sp., t. 31; *Exostyles venusta*, 26, t. 25; *Fenzlia obtusa*, n. sp., 19, t. 17; *Fenzlia retusa*, n. sp., 20, t. 18; *Ficinia aphylla*, 12, t. 12; *Gillia* (=*Gilia*) *dianthoides*, n. sp., t. 29; *Gonotheca Blumei*, 23, t. 22; *Haloragis ceratophylla*, 16, t. 15; *Hemispadon pilosus*, n. sp., 3, t. 3; *Klotzschia brasiliensis*, 21, t. 19; *Kohautia senegalensis*, 24, t. 23; *Limnanthes Douglasii*, t. 27; *Lippaya telephioides*, n. sp., 13, t. 13; *Malesherbia fasciculata*, 9, t. 9; *Monotaxis tridentata*, n. sp., 8, t. 8; *Morus Brunoniana*, n. sp., t. 32; *Odontostemma glandulosum*, t. 34; *Polygala Hilariana*, 4, t. 4; *Portulaca australis*, n. sp., 7, t. 6; *Pseudanthus pimeleoides*, 11, t. 11; *Quintinia Sieberi*, t. 10; *Rubus Zahlbrucknerianus*, n. sp., t. 35; *Schiedea ligustrina*, 15, t. 14; *Sipanea radicans*, n. sp., 7, t. 7; *Ungnadia speciosa*, n. sp., t. 36.

Morus Brunoniana, Endlicher, Atakta Bot. t. 32. 1835 is usually considered conspecific though not identical with *M. pendulina* Endlicher, Prodr. Fl. Norfolk 40. 1833, the collective species being known as *Pseudomorus Brunoniana* (Endl.) Bureau. The epithet *pendulina* (referring to the pendulous male catkins) has, however, priority over *Brunoniana* (honouring Robert Brown, 1773–1858) since Endlicher's *Prodromus Florae Norfolkicae sive Catalogus Stirpium quae in Insula Norfolk annis 1804 et 1805 a Ferdinando Bauer collectae* was undoubtedly published in 1833, being listed in Hinrichs, *Verz. Bücher July-Dec. 1833*, p. 55 and reviewed in Allgemeine Bot. Zeitung 16: ii (48): 754. Dec. 1833, while part 4 of the *Atakta botanika*, containing pls. 25–40, did not appear until 1835. The area of the genus *Pseudomorus* Bureau (Moraceae) extends from Australia (New South Wales, Queensland) over Norfolk Island and New Caledonia to Hawaii. The four geographically isolated populations which make up this range might be regarded as independent species, but Bureau, Bentham and Skottsberg* treat them as conspecific. Comparison

* Accepting Skottsberg's view of the taxonomy of *Pseudomorus* as outlined in Acta Horti Gotoburg. 15: 347–350. 1944, the nomenclature of the group is as follows: —

Pseudomorus pendulina (Endl.) Stearn, trans. nova.

Pseudomorus pendulina var. α **pendulina**, var. nov.
Morus pendulina Endlicher, Prodr. Fl. Norfolk. 40. 1833.
Streblus pendulina (Endl.) F. Mueller, Fragm. Phyt. Austral. 6: 192. 1868.
Pseudomorus Brunoniana α *pendulina* (Endl.) Bureau in Ann. Sci. Nat. Bot. sér. 5, 11: 372. 1869. — De Candolle, Prodr. 17: 249. 1873, sensu stricto.
Pseudomorus Brunoniana α *pendulina* subvar. *castaneaefolia* variatio *scabra* Bureau in Ann. Sci. Nat. Bot. sér. 5, 11: 373. 1869. — De Candolle, Prodr. 17: 250. 1873.
Norfolk Island.

Pseudomorus pendulina var. β **australiana** (Bureau), comb. nov.
Morus Brunoniana Endlicher, Atakta Bot. t. 32. 1835.
Streblus Brunoniana (Endl.) F. Mueller, Fragm. Phyt. Austral. 6: 192. 1868.

of abundant material showing adequately the variation within each population is needed to make clear the extent of morphological overlap; their present classification is necessarily provisional.

Stephan Ladislaus *Endlicher* was born at Bratislava (Pressburg), then part of the Austrian Empire, now in Czechoslovakia, on 24 June 1804 and died at Vienna on 28 March 1849. He studied at the Universities at Budapest and Vienna, obtaining his doctorate of philosophy in 1823. Although he intended an ecclesiastical career, the study of natural history and of languages attracted him strongly and in 1826, for family reasons, he resigned holy orders. He then joined the staff of the Imperial Library at Vienna in 1827, being employed on the preparation of the catalogue of manuscripts, and became Keeper (Custos) of the Imperial Natural History Collections (Hofnaturalien-Cabinette) in 1836. On the death of Joseph Franz Jacquin in December 1839 Endlicher succeeded him as Professor of Botany at the Wiener Hochschule and Director of the Botanic Garden. His colleague Eduard Fenzl then became Custos of the Hofnaturalien-Cabinette. During this period Endlicher prepared not only such important botanical works as his *Flora Posoniensis* (1830), *Prodromus Florae Norfolkicae* (1833), *Genera Plantarum* (1836–41), *Enumeratio Plantarum* xx *Novae Hollandiae* (1837) but also a catalogue of the codices in the Imperial Library (1836), and a catalogue of the Chinese and Japanese coins at Vienna (1837).

After the completion of the *Genera Plantarum* Endlicher published a companion volume *Enchiridion Botanicum exhibens Classes et Ordines Plantarum* (1841), devoted to the definition of the families and merely listing the genera. He also wrote a *Synopsis Coniferarum* (1847) and collaborated with Eduard Poeppig in writing the text of vols. 1 and 2 (1835–38) of *Nova Genera ac Species Plantarum, quas* xxx *legit E. Poeppig*. This immense literary output is as remarkable for its variety

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Pseudomorus Brunoniana (Endl.) Bureau in Ann. Sci. Nat. Bot. sér. 5, 11: 372. 1869. — De Candolle, Prodr. 17: 249. 1873, sensu stricto. — Bentham, Fl. Austral. 6: 181. 1873. — C. Moore et Betche, Handbk. Fl. N. S. Wales, 83. 1893. — F. M. Bailey, Compr. Cat. Queensl. Pl. 485. 1913.

Pseudomorus Brunoniana β *australiana* Bureau in Ann. Sci. Nat. Bot. sér. 5, 11: 373. 1869. — De Candolle, Prodr. 17: 250. 1873.

Australia (Queensland, New South Wales); cf. Bentham (1873), Moore et Betche (1893).

Pseudomorus pendulina var. γ **obtusata** (Bureau), comb. nov.

Pseudomorus Brunoniana γ *obtusata* Bureau in Ann. Sci. Nat. Bot. sér. 5, 11: 374. 1869. — De Candolle, Prodr. 17: 250. 1873.

New Caledonia; cf. Guillaumin, Cat. Phan. Nouvelle-Calédon. Apét. 26. 1911.

Pseudomorus pendulina var. δ **sandwicensis** (Degener), comb. nov.

Pseudomorus sandwicensis Degener, Fl. Hawaii. 21/12. 1938.

Pseudomorus Brunoniana var. *sandwicensis* (Degener) Skottsberg in Acta Horti Gotoburg. 15: 347. 1944.

Hawaiian Islands (Kauai, Oahu, Hawaii).

and quality as for its volume; it reveals, as his biographer Wurzbach* truly noted, an exceptional range of knowledge and fertility of spirit, and is distinguished by a depth of understanding, independence and keeness of judgment and acuteness of observation, which place Endlicher among the great taxonomists of the nineteenth century, with Augustin Pyramus de Candolle, George Bentham, Sir Joseph Hooker and Adolf Engler. Botany naturally occupied most of his attention after his appointment as Professor of Botany, but he worked nevertheless at publications on the elements of Chinese grammar (1845) and the laws of Saint Stephan (1849). Popular with his students and a liberal-minded patriot, Endlicher took part in the unsuccessful Vienna Revolution of 1848 and was punished by being deprived of his professorship. Life then became so miserable for him that he is believed to have ended his troubles by suicide. Thus, prematurely and tragically, ended a life industriously and fruitfully spent in public service and the advancement of learning.

LINDLEY LIBRARY,
ROYAL HORTICULTURAL SOCIETY,
LONDON, ENGLAND.

* See C. V. Wurzbach, *Biographisches Lexikon des Kaiserthums Oesterreich* 4: 44–46. 1858 for a biography and bibliography of Endlicher and op. cit. 4: 179–181. 1858 for a biography and bibliography of his co-worker and successor Eduard Fenzl (1808–1879).

ON THE IDENTITY OF THE GENERA CUPULISSA RAF. AND PLATOLARIA RAF.

E. D. MERRILL AND N. Y. SANDWITH.

Platolaria Raf. Sylva Tellur. 78. 1838, with a single species, *P. flavescens* Raf., was based entirely on *Bignonia orbiculata* Jacq. = *Anemopaegma orbiculatum* (Jacq.) DC. The record here is clear, but manifestly *Platolaria* Raf. (1838) has priority over *Anemopaegma* Mart. (1845). A synonym of *Anemopaegma orbiculatum* (Jacq.) DC. is *Pithecoctenium panamense* Benth. Bot. Voy. Sulph. 129. 1844.

The case of *Cupulissa* Raf. Flora Tellur. 2: 57. 1836 [1837], currently placed as a synonym of *Bignonia* Linn., was not so clear. Because it became desirable to place *Cupulissa* Raf., in connection with the preparation of a comprehensive Index Rafinesquianus by the senior author, an inordinate amount of time was devoted to this case, with much correspondence regarding the matter. The difficulty was that no botanist had made a critical study as to the generic position of *Bignonia grandifolia* Jacq., which manifestly does not belong in *Bignonia* as that genus is currently restricted. The species is now shown to belong in *Anemopaegma* Mart., and thus we have still another generic name, *Cupulissa* Raf., to account for, earlier than both *Platolaria* Raf. and *Anemopaegma* Mart. On the basis of strict priority *Cupulissa* Raf. takes precedence over the other two proposed names for this particular genus.

Several excellent coloured plates of *Bignonia grandifolia* Jacq. have been published, all apparently based on material derived from the plant first cultivated in Vienna toward the end of the eighteenth century. Probably the chief reason why Jacquin's striking species was not disposed of earlier was that it remained unrepresented in most European and American herbaria until very recently and again because its fruits were, and still are, unknown. As a matter of fact the species, said to have come from Carácas, and originally described from a living specimen in conservatory cultivation in Vienna before 1798, was not actually re-collected in Venezuela or elsewhere until 1937, approximately 140 years after it was first described and illustrated. This, in view of the distinctly spectacular nature of the species, with its abundance of large, bright yellow flowers, is all the more surprising. The explanation is that apparently the species is of somewhat local occurrence, and that it grows in regions which have not, until very recently, been intensively explored from a botanical standpoint. Probably the indication of the type locality as "Caracas" has confused the issue, for the species does not grow in the immediate vicinity of the city of Carácas, although it is now known from one modern collection in Venezuela.

From an examination of the original description and the several coloured plates it was evident that some group in the vicinity of *Anemopaegma* Mart. was represented, but from the data available, and with no specimens for study, the senior author could not be certain as to the genus actually represented. Attempts to match Jacquin's species in the extensive collections at the Muséum d'histoire naturelle, Paris (Dr. Pichon), at the New York Botanical Garden (Dr. Moldenke), at the Missouri Botanical Garden (Dr. Seibert), at the Gray Herbarium and the Arnold Arboretum failed, and the first attempts at the U. S. National Herbarium and at the Chicago Natural History Museum were fruitless. An examination of the material in the herbaria in and near London by the junior author failed to locate any specimen in the Lindley Herbarium (Dr. Gilbert-Carter), at the British Museum (Dr. George Taylor), and at Kew, other than one specimen in the latter herbarium placed under the unidentified specimens of *Anemopaegma*. This was labelled in Sir William Hooker's handwriting "*Bignonia grandifolia* Bot. Mag. Hort. Eblan. [Dublin]." The specimen was clearly taken from the plant on which the Botanical Magazine plate was based. Some years ago the junior author had written on the sheet "cf. *Anemopaegma*." A critical re-examination of the specimen showed clearly that it agrees with *Bignonia grandifolia* Jacq. and that *Anemopaegma* Mart. is the genus represented. An opened calyx shows the characteristic disk and ovary perfectly. The leaflets agree very well with those of Jacquin's plate, as do the pseudostipules, the tendril, the calyx, the long linear bracts, and the stamens. The curious "warts" or "raised points" on the branchlets, petioles, and peduncle are actually raised lenticels, and are fewer and less conspicuous on the Botanical Magazine specimen than as shown in Jacquin's illustration; in the latter it is suspected that the number and eminence was exaggerated. We have seen nothing exactly like them in any other described species of *Anemopaegma*. The apparent discrepancy in the calyx-margin as shown in the several plates is of no significance; in fact, some of the calyces of the Botanical Magazine material are split and irregularly lacerate exactly as shown in Jacquin's plate. Neither is there any significance in the fact that the inflorescences as shown in the Botanical Magazine, based on the Dublin specimen, and in the Botanical Register (based on a specimen grown by Mr. Catley at Barnet) exhibit no 3-flowered cymes in the lower parts. The junior author's first report after having attentively examined three coloured plates (Jacquin's original, Botanical Register, and Botanical Magazine), and descriptions, and considering the several genera suggested as possibilities, includes the statement:

"First of all, even without other evidence, I have no hesitation in referring the plant figured and described by Jacquin as *Bignonia grandifolia* to the genus *Anemopaegma*. The three plates represent one and the same species. Jacquin's species has the characteristic ovary of *Anemopaegma* (ellipsoid or ovoid-ellipsoid, often striate or furrowed, and usually conspicuously contracted into the disk), as well as the large pulvinate disk.

Other characters such as the simple tendril, the absence of gland-fields at the nodes, the calyx, and the glabrous, bright yellow corolla are all characters of species of *Anemopaegma*."

We have been unable to refer the species to any described one now placed in *Anemopaegma*, or for that matter, in any other allied genus. It is believed that had the fruits been known (they are still unknown and hence undescribed) that the species might long since have been transferred to *Anemopaegma*.

With certain definite data available regarding the generic position of the species requests were again sent to the Chicago Natural History Museum and to the U. S. National Herbarium for a re-examination of the unnamed Venezuelan material in *Anemopaegma* and in *Bignonia*. Dr. Steyermark reporting from Chicago, and Mr. Killip, reporting from Washington, are in agreement that *Bignonia grandifolia* Jacq. is actually represented by one modern collection, this being *Pittier 14023* from the Ocumare Valley, Venezuela, May 29, 1937. The senior author has actually examined the Chicago specimen, courteously loaned for the purpose, and agrees with this identification of it.

These new data were transmitted to Dr. Léon Croizat who had recently reported for duty in Carácas. On March 24, 1947, he reported that there are two places in Venezuela known as Ocumare, one Ocumare de la Costa in the State of Aragua, the other, Ocumare del Tuy in the state of Miranda; and that the Pittier collection came from Ocumare de la Costa. The actual place where Dr. Pittier rediscovered the species is about 90 kilometers, air line, or about 140 kilometers by road, from Carácas, on the northern slopes of the coastal cordillera, approximately 600 meters below the pass leading from Maracay to Ocumare; this is the road from Carácas to Puerto Cabello, and, one suspects, the route that Jacquin followed on leaving Carácas on his return to Europe. With the generic identity of Jacquin's striking species now established, and with the Botanical Magazine specimen and one modern collection for examination, the following transfer is made:

ANEMOPAEGMA Martius ex de Candolle Prodr. 9: 187. 1845.
Cupulissa Rafinesque Flora Tellur. 2: 57. 1836.
Platolaria Rafinesque Sylva Tellur. 78. 1837.

Anemopaegma grandifolium (Jacq.) comb. nov.

Bignonia grandifolia Jacq. Pl. Hort. Schoenbr. 3: 19, *pl. 287*. 1798; Willd. Sp. Pl. 3: 296. 1801; Poir. in Lam. Encycl. Suppl. 1: 633. 1810; Edwards Bot. Reg. 5: *pl. 418*. 1819; Spreng. Syst. Veg. 2: 830 [sphalm. grandiflora]. 1825; Hook. Bot. Mag. 57: *pl. 3011*. 1830; Van Géel Sert. Bot. Cl. xiv. 1830 (the binomial erroneously credited to Willdenow; the coloured plate based on Bot. Reg. *pl. 418*); Reichb. Fl. Exot. 3: 48, *pl. 213*. 1835 (the coloured plate a reproduction of that of Van Géel); DC. Prodr. 9: 159. 1846; Knuth Repert. Sp. Nov. Beih. 43: 638. 1927 (Init. Fl. Venezuel.).

Cupulissa grandifolia Raf. Fl. Tellur. 2: 57. 1836 [1837], based on *Bignonia grandifolia* Jacq.

Messrs. Willdenow, Sprengel, De Candolle, and Knuth, saw no speci-

mens representing the species, accepting it on the authority of Jacquin or of later authors. On the other hand Poiret adds at the end of his description "v.s." indicating that he had seen a specimen. There is no evidence that Van Géel or Reichenbach knew the species in cultivation for their coloured plates are manifestly copied from the one in the Botanical Register. Their statement as to the year of introduction into Europe, 1815, is of course erroneous, and was perhaps suggested by the Botanical Register entry of 1819: "We believe the plant is of very recent introduction." We suggest that the species did not persist in conservatory cultivation in Europe because of its rank growth habit.

With this disposition of *Bignonia grandifolia* Jacq., we now take up the problem of the proper generic name. *Cupulissa* Raf. (1836) has priority followed by *Platolaria* Raf. (1837), and *Anemopaegma* Mart. (1845). With 60 binomials already published in *Anemopaegma* Mart. and because that name has been consistently used since 1845 as the generic one for this group, we unhesitatingly recommend that *Anemopaegma* Mart. ex DC. Prodr. 9: 187. 1845, be added to the list of conserved generic names, and that *Cupulissa* Raf. Flora Tellur. 2: 57. 1836 [1837], and *Platolaria* Raf. Sylva Tellur. 78. 1838, be rejected.

Rafinesque's original descriptions of his two new genera are characteristically short, yet there is no doubt as to exactly what he had in mind. That of *Platolaria* Raf. Sylva Tellur. 78. 1838 is:

"448. PLATOLARIA Raf. diff. Bignonia Siliqua maxima orbiculata plana. *Scandens, fol. digit. fl. racemosis* — Very distinct by mere fruit said to be akin to that of Bign. cerulea, see 458. The flowers are not described."

"449. *Platolaria flavescens* Raf. Bign. orbiculata Jaq. auct. — fol. 5 natis ovatis acum. cirrhosis, racemis axil, sub 10fl. — Carthagena, fl. yellowish."

The description of *Cupulissa* Raf. Flora Tellur. 2: 57. 1836 [1837], is somewhat more ample. The problem here was a proper interpretation of *Bignonia grandifolia* Jacq., which was the sole basis of the proposed new genus.

"203. CUPULISSA Raf (cup split) diff. from Bignonia, cal. cupularis integro latere fisso, Cor. tubulosa campanul. limbo undulato subeq. 5lobo, lob. inf. fisso. filam. basi glandul. hirsutis, didyn. quinto ster. ovar. supra disco glanduloso, stigma bilamel. *Scandens, fol. conjug. fl. racemosis.* — Type *C. grandifolia*, foliolis 2 ovatis undul. cirrhosis verrucosis, racemis multifl. pedic. bibract. flexuosis. — Carracas, large yellow flowers. *Bignonia grandif.* Jaq. hort. 287. Bot. Reg. 418, Bot. Mag. 3011, auctoris. Probably several Bignonias belong here, the real have cal. dent. cor. bilabiate &c."

The above is the Rafinesque record for the two genera. As no other botanist has ever recognized either of them while *Anemopaegma* Mart. is universally accepted, and further because of the large number of species involved, we believe that we are justified in recommending the conservation of Martius' generic name and the rejection of the two earlier Rafinesque

ones. Of the two Rafinesque names *Cupulissa* Raf. is earlier than *Platolaria* Raf. so that if others do not agree with our conclusions, as to the retention of *Anemopaegma* Mart., *Cupulissa* Raf. would be the logical choice.

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STUDIES IN THE THEACEAE, XVI
BIBLIOGRAPHICAL NOTES ON THE GENUS LAPLACEA

CLARENCE E. KOBUSKI

WHILE WORKING over the genus *Laplacea* in connection with my study of Theaceae I have discovered that by some peculiar oversight the type-species of the genus *Wikstroemia* Schrader has never been officially transferred to *Laplacea*, the accepted name by which Schrader's entity is now known.

As far as the generic name *Laplacea* is concerned, there is no involved synonymy if one abides by the "Rules of Nomenclature," since the name has been adopted as one of the "nomina conservanda." However, before *Laplacea* was placed on the conserved list considerable feeling was expressed by various authors in favor of one or another of the generic names now recognized as synonyms of the genus.

Blake, in Contrib. Gray Herb. 53: 39. 1918, made a very detailed study of the situation and maintained that the original name *Wikstroemia* Schrader should be retained for the genus, regardless of the fact that a much larger genus in the Thymelaeaceae possessed the same name and had been placed on the list of conserved names in 1905. At the same time he proposed new combinations for all the then existent species and varieties of Schrader's genus.

However, as Blake pointed out, *Wikstroemia* Schrader was described in 1821, while *Wikstroemia* Endlicher, a genus of the Thymelaeaceae, was introduced much later, in 1833. Also the name *Wikstroemia* Endlicher, borne by a large genus and generally accepted, was long antedated by the name *Capura* Linnaeus which was introduced in 1771. There was good logic in Blake's stand, which, however, went for nought, since the name *Wikstroemia* had already been adopted and conserved for the larger genus in the Thymelaeaceae. *Laplacea* was eventually conserved for the genus of the Theaceae. It is interesting to note that when the name *Laplacea* finally appeared as the conserved name in Kew Bull. 1940: 112. 1940, the synonym or rejected names listed were *Haemocharis* Salisb. and *Lindleya* Nees. *Wikstroemia* Schrad. was not listed. This may be accounted for in part, possibly, by the fact that *Wikstroemia* Endlicher of the Thymelaeaceae had appeared on the conserved list many years earlier. However, there seems to be no reason for the oversight considering the fact that previous publicity had been given Schrader's genus by Blake, Rehder and Sprague, and in all three cases in the interpretation of Rules of Nomenclature.

It was while reviewing Blake's paper and tracing his references, some of

them obscure and difficult to obtain, that I realized that the correct combination for Schrader's original species had never been made.

Because of the obscurity of the publications, I relate below in detail the circumstances concerning the early publications of the names *Wikstroemia fruticosa* Schrader and *Lindleya semiserrata* Nees.

In the short span of 33 days in the year 1821 the real story of the genus was unfolded. On May the fifth, 1821, Schrader, in Göttingische gelehrten Anzeigen (No. 72, p. 710), a publication which evidently appeared three times weekly, published the new genus *Wikstroemia*, and on the following page listed a single species *W. fruticosa*, spelled "fructicosa." This new binomial was based on a specimen (no. 15), collected by Prinz Maximilian von Neuwied in Brazil. The generic description was in Latin and as complete as any of the descriptions for members of the Theaceae at that time. There could be no questioning of the date since a date appeared on every leaf of the publication, varying, of course, with the time of publication.

In the same month, at Regensburg, on May the twenty-first, Nees, in volume 4 of Flora, known also as Botanische Zeitung Regensburg (no. 19, p. 299), published a new genus *Lindleya*, giving no specific name, however. Nees had received a duplicate set of the Brazilian plants collected by Prinz Maximilian von Neuwied. By an odd coincidence Nees based his new genus *Lindleya* on the same Neuwied number which Schrader had cited in his publication of approximately two weeks earlier.

It may be assumed that Nees saw Schrader's publication of May 5, 1821, very shortly after it appeared, for on June 7 Nees (Flora vol. 4, p. 328) listed the combination *Lindleya semiserrata*, but merely as a synonym of *Wikstroemia fruticosa*. He mentioned that his own work on the collection was in manuscript form and in the hands of the collector (Neuwied) at the time. He further stated that he would rescind his earlier abstract (presumably that of May 21, 1821), since its publication was antedated by that of Schrader. He wrote also that, since it would be very instructive to see just how he agreed or disagreed with Schrader's treatment, he would offer a bit of amusement for the readers of "Flora" by listing his synonyms along with the original names of Schrader.

There seem to have been approximately fifty numbers in the set of specimens worked over by Schrader. Nees' set was less complete, since he listed twelve numbers as missing from his set. Of the approximate thirty-five numbers which the two workers had in common, Nees offered synonyms for fifteen of Schrader's new species. Of course these synonyms of Nees were all actually new combinations. His manner of listing is as follows: "15. Wickstroemia fruticosa Schr. ist Lindleya semiserrata m."

Just what feeling existed between the botanists of that time is difficult to ascertain; also the circumstances regarding the publication of the identifications on the Prinz Maximilian von Neuwied collection. At any rate, in the same year, Sprengel, in Vet. Akad. Handl. Stockholm 1821: 167. 1821, published a second genus, *Wikstroemia* (Compositae), named after

the same Dr. J. E. Wikström. He ignored Schrader's genus of the same name, failing to mention its existence. A footnote by the editor drew attention to Schrader's earlier *Wikstroemia* but stated that it was understood to be merely a synonym of Nees' *Lindleya*. The exact month of the last-mentioned publication is not certain. However, the complete action involving this confusion in synonymy took place in less than eight months!

In the following year (1822) Humboldt, Bonpland & Kunth (Nov. Gen. Sp. Pl. 5: 207) introduced the genus *Laplacea*, the name now conserved by the "International Rules." The date printed in the front of the volume was 1821, which might have confused the issue even further. However, according to Barnhart in Bull. Torrey Bot. Club 29: 595. 1902, the date of publication has been ascertained as 1822, rather than 1821. The type-species was in no way involved by the creation of the genus *Laplacea*, since H. B. & K. described *L. speciosa* from Peru in their work, not the species under discussion. *Laplacea speciosa* was designated as the type of the genus when the generic name *Laplacea* was conserved.

Four years later (1826), Martius and Zuccarini in Nov. Gen. Sp. 1: 107, t. 66, entered still another name, *Haemocharis*, and used the binomial *H. semiserrata*. *Lindleya* Nees was reported in the synonymy of *Haemocharis*, but not the binomial *L. semiserrata*.

The next year (1827), Cambessedes, in St. Hilaire, Fl. Bras. Mer. 1: 300, accepted *Laplacea* and transferred thereto *Haemocharis semiserrata*, attributing the parenthetical authorship to Martius & Zuccarini. Since that time the species has been recorded under either *Laplacea* or *Haemocharis* with the specific name "semiserrata."

A detailed record of the synonymy of this species follows:

Laplacea fruticosa (Schrader) Kobuski, comb. nov.

Wikstroemia fruticosa Schrader in Götting. Gel. Anzeig. 1821 (71): 711. May 5, 1821; "fructicosa." — Pontin [Editor] in Vet. Akad. Handl. Stockholm 1821: 168. 1821, obs. in footnote. — Blake in Contrib. Gray Herb. 53: 39. 1918.

Lindleya semiserrata Nees in Flora 4(1): 328. June 7, 1821, nom. nud., as syn.

Haemocharis semiserrata (Nees) Martius & Zuccarini, Nov. Gen. Sp. 1: 107, t. 66. 1826. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève 1: 144 (Mém. Ternstr. 56). 1855. — Szyszylowicz in Nat. Pflanzenfam. III. 6: 185, 189. 1893.

Gordonia semiserrata (Nees) Sprengel, Syst. Veg. Cur. Post. 1(2): 260, 408. 1827.

Laplacea semiserrata (Nees) Cambessedes in St. Hilaire, Fl. Bras. Mer. 1: 300. 1827; in Mém. Mus. Genève 16: 407, t. 1, fig. A. 1828. — Spach, Hist. Nat. Veg. 4: 76. 1835. — Hooker in Curtis's Bot. Mag. 70: t. 4129. 1844. — Wawra in Martius, Fl. Bras. 12(1): 289. 1886. — Melchior in Nat. Pflanzenfam. ed. 2, 21: 136. 1925.

Laplacea inaequilatera Schott in Sprengel, Syst. Veg. Cur. Post. 4(2): App. 408. 1827.

Laplacea praemorsa Splitgerber in Hoeven & De Vries, Tijdschr. 9: 100. 1842; iter. ex Mohl, Bot. Zeit. 1: 95. 1843.

Laplacea camellioides Sonder in Linnaea 22: 549. 1849.

Haemocharis camellioides (Sonder) Kuntze, Rev. Gen. Pl. 1: 62. 1891.

Haemocharis praemorsa (Splitgerber) Kuntze, Rev. Gen. Pl. 1: 62. 1891.

Laplacea inaequalilatera Hooker & Jackson, Index Kew. 2: 30. 1894, sphalm.

Lindleya fruticosa Hooker & Jackson, Index Kew. 2: 89. 1894, lapsu.

This species is probably the largest and most widespread in all the

genus. To date it has been recorded from Brazil, the Guianas, Colombia, Venezuela, Peru and Bolivia in South America, Panama and even up into Mexico. Of the last I am doubtful.

Also several varieties have been described under *Laplacea semiserrata*. Eventually a more detailed study will show whether these varieties are worthy of recognition. The brief study made so far causes the author to be skeptical of the true varietal lines, and with this in mind he is unwilling to make further new combinations until these entities are studied in relationship with the other described species of the genus.

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NEW PLANTS FROM NORTHEASTERN SONORA, MEXICO AND NOTES ON EXTENSIONS OF RANGE[1]

STEPHEN S. WHITE

BEGINNING IN 1938 the writer spent four consecutive summers in northeastern Sonora, Mexico, principally in the region of the Río de Bavispe, collecting plants for the University of Michigan Botanical Gardens and the Arnold Arboretum of Harvard University. Although not particularly inaccessible this area has received practically no attention from botanists. The only previous collectors in this region, besides those of the Mexican Boundary Survey, were Hartmann and Lloyd, botanists of the Lumholtz Archeological Expedition, who collected along the route of travel from Bisbee, Arizona through the Sonoran towns of Fronteras, Oputo, Granados, Bacadéhuachi, Nácori and thence into Chihuahua. This expedition was in Sonora only about three months.

More than 4000 numbers were collected in northeastern Sonora by the writer and those who at different times accompanied him (LeRoy H. Harvey, Edwin A. Phillips and José Vera Santos). Among them are the following novelties as well as certain other species whose presence in the area represents a notable range extension. A detailed report on the collections as a whole is in preparation and will be published at a later date.

Ceterach Dalhousiae (Hook.) C. Chr.

In 1940 Edwin A. Phillips collected this little known fern in the Cañón de Bavispe, a few miles west of the village of Bavispe (*E. A. Phillips 547*). Northeastern Sonora must therefore be included in the peculiar range of this plant, formerly known only from southeastern Arizona, Abyssinia and the Himalayan region of Asia. Mr. Phillips also found in this same location *Asplenium exiguum* Bedd. (*E. A. Phillips 550*), which has a similar distribution but which had been collected previously in northern Mexico.

Populus monticola Brandeg.

Originally described from Baja California, this tree was later collected by Palmer at Guaymas, Sonora. The writer's collection (*S. S. White 691*) from Arroyo del Púlpito, north of Colonia Oaxaca, probably represents the northern limit of the species, since this point is only about 60 miles south of the United States border, where it is unknown.

Ostrya virginiana (Mill.) Koch.

C. H. and M. T. Muller have collected this species in Nuevo León, but

[1] Papers from the Department of Botany and Botanical Gardens of the University of Michigan, No. 843.

the writer has seen no record of its presence in western Mexico, except the recent report by Gentry[2] who collected it in the Sierra Surotato in northern Sinaloa. The writer found it in the Sierra de El Tigre, Sonora, growing with walnut, sycamore, ash, maple and oak (*S. S. White 583, 605, 3388, 3504*). This wide-spread tree of eastern North America thus has at least two isolated outposts on the Pacific watershed, separated by a distance of 500 miles or more from the nearest eastern station.

Undoubtedly *Ostrya* in Sonora and Sinaloa is a relic of Miocene and Pliocene times when *O. oregoniana* Cheney (considered to be identical with or hardly distinguishable from *O. virginiana*) flourished in the northwestern United States; at present it is not possible to tell, however, whether *O. oregoniana* ranged as far south as Sonora and Sinaloa, or whether *O. virginiana* extended westward to these localities through southern United States or northern Mexico.

Phacelia heterophylla Pursh var. **sonorensis** var. nov.

Herba perennis, robusta, erecta, 15–30 cm. alta, ubique canescenter hispida et glandulosi-pubescens. Folia breve petiolata, ovata, majora 5 cm. longa et 2.5 cm. lata. Corolla albida.

TYPUS: *S. S. White 4641*, "Puerto del Cumarito, Sierra de la Cabellera, Sonora, Mexico," in Herbario Universitatis Michiganensis.

This variety differs from the typical form of the species in being densely, although minutely, glandular in all its parts except the corolla and internal floral organs; the leaves are also smaller and generally lack the one or two small leaflets which are commonly present in *P. heterophylla*.

The type was collected at an elevation of 5400 feet in an oak-grassland association. The Sierra de la Cabellera lies north of the Río de Bavispe and west of the Sierra del Púlpito.

Pentstemon campanulatus (Cav.) Willd. var. **subglandulosus** var. nov.

Herba erecta, perennis, 60 cm. alta. Folia elliptica, acuta, in specimine typico majora 7 cm. longa et 2 cm. lata, inferiora petiolata, superiora sessilia, ab media parte ad apicem grosse serrata vel serrulata, floralia integra.

TYPUS: *S. S. White 2645*, "Cañón de Huépari, Sonora, Mexico," in Herbario Universitatis Michiganensis.

This variety differs markedly in aspect from *P. campanulatus*, but except for the size and shape of the leaves the only other significent difference noted is in the distribution of the glandular hairs. In the variety they are confined to the calyx and pedicels, but in the typical form of the species these parts as well as the corolla, peduncles, upper portion of the stem and even the upper leaves are often copiously glandular-pubescent.

The type locality lies midway between the towns of Oputo and Huachinera at an elevation of 4300 feet. The vegetation is oak-grassland.

[2] GENTRY, HOWARD SCOTT. Notes on the vegetation of Sierra Surotato in northern Sinaloa. Bull. Torrey Bot. Club 73: 451–462, *f. 1–5*. 1946.

Lonicera cerviculata sp. nov.

Frutex 2 m. altus, ramis glabris, juvenilibus purpurei-glaucis, deinde flavescentibus et nitidis. Folia oblongi-ovata, supra glabra, subtus puberula et perspicue glauca, basi truncata, apice obtusa vel subacuta, 4–8.5 cm. longa, latitudine circiter $\frac{2}{3}$ longitudinis. Dua vel tria summa paria foliorum perfoliata, oblonga, alia breviter petiolata, estipulata. Inflorescentiae spicatae, 1–3 terminales et aliae axillares solitariae in axillis paenultimi paris foliorum. Flores verticillati, a bracteis exterioribus 2 mm. longis et interioribus vix 1 mm. longis subtendentes. Calycis pars supra ovarium constricta 1 mm. longa, glauca, lobulis 5 ovatis vix 1 mm. longis. Corolla 12–14 mm. longa, aurantiaca vel rubella, siccitate flava, subventricosa, intus et extus glabra, lobulis 5 aequalibus. Staminum filamenta 1 mm. longa; antherae 2 mm. longae. Ovarium 3-loculatum, stylo glaberrimo in tubo corollae incluso. Fructus globosus, 4–5 mm. crassus, in tubulum calycis desinens. Semina 1–6, albida, compressa, ovoidea, foveolata, 3–4 mm. longa et ca. 2 mm. lata.

TYPUS: *S. S. White 3422*, "Las Tierritas de El Temblor, Sierra de El Tigre, Sonora, Mexico," in Herbario Universitatis Michiganensis.

This species belongs to the subgenus *Periclymenum L.* and to Rehder's subsection *Phenianthi*[3], although its flowers are much smaller than those of other members of this group.

Besides the type the writer also refers to this species his collections *2832*, *3934*, *4195* and *4277*, all of which, with the exception of *3934*, are from the Sierra de El Tigre, not far from the type locality. The other specimen was found at Rancho de la Nacha, northeast of Nacozari. These have at times a single terminal spike and no axillary spikes; in some there is only one pair of connate leaves. In none of the specimens cited are any spikes to be found in the axils of the third pair of leaves, even when this pair is connate.

The name of this species refers to the neck-like calyx-tube which persists on the fruit, preserving the same size and shape that it had in flower. Its habitat is the pine-oak vegetational zone at elevations of 4500 to 6000 feet.

Lonicera cerviculata may be distinguished from *L. arizonica* Rehd., apparently its nearest relative, by its smaller flowers, elongate rather than capitate spikes, and the lack of ciliate hairs on the leaf margin.

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[3] REHDER, ALFRED. Synopsis of the genus *Lonicera*. Rep. Missouri Bot. Gard. **14**: 27–232, *pl. 1–20*. 1903.

NOTES ON THE ASIATIC FLORA

HUI-LIN LI

A NEW SPECIES OF SCROPHULARIA FROM UPPER BURMA

IN A STUDY of the genus *Scrophularia* of China, it is noted that in the alpine regions of western China and adjacent areas there occur many endemic species of very limited range. Continuous to western Yunnan in Upper Burma there appears an apparently new species which is herein described. The material is based on the collections of the herbarium of the New York Botanical Garden.

Scrophularia birmanica sp. nov.

Planta nana, 15–18 cm. alta, caulibus simplicibus glabris, erectis, basi squamosis, rhizomate lignoso longo crasso 6–7 cm. longo; foliis oppositis breviter petiolatis, petiolis ad 2–3 mm. longis, subalatis margine ciliatis, lamina ovata, ad 2.5 cm. longa et 1.8 cm. lata, apice acuta, basi rotundata vel subcordata, margine irregulariter acute crenato-serrata, foliis in sicco chartaceis utrinque glabris, reticulo nervorum subtus conspicuo; inflorescentiis in verticillastris 1–2 densis multifloris aggregatis, pedicellis erectis 3–5 mm. longis glabris; bracteis lanceolatis 4–5 mm. longis, calycibus 6–7 mm. longis glabris ad 2/3 lobatis, subobliquis, lobis oblongis obtusis vel rotundatis, extus parce puberulis; corolla flava 1.5 cm. longa, 4–5 mm. lata, intus villosa, extus glabra, tubo fere cylindrico, 8–10 mm. longo; lobo summo 5–7 mm. longo, alte bilobo, lobis rotundatis, lobis lateralibus et lobo antico 2–3 mm. longis rotundatis, erectis; staminibus inclusis, filamentis parce pubescentibus; staminodio reniformi; stylo glabro, 5 mm. longo; ovario glabro; capsula ignota.

Type, on stony alpine meadows, at altitudes of 3660–4020 meters, on western flank of N'Maika-Salwin divide, Upper Burma, collected in flower, June, 1925, by *G. Forrest*, no. *26859*; holotype in the herbarium of the New York Botanical Garden.

UPPER BURMA: Western flank of N'Maika-Salwin divide, *G. Forrest 26859, 27308*, in the herbarium of the New York Botanical Garden.

This species is related to *S. Delavayi* Franch. of northwestern Yunnan, differing in being of smaller size, with smaller and shorter petiolate leaves, rounded calyx-lobes, and narrower corolla.

THE GENUS DIPHYLLEIA

The genus *Diphylleia* of the Berberidaceae is of particular interest because of its phylogenetic and distributional significance. Like other perennial herbaceous genera of the family, such as *Podophyllum*, *Jeffersonia*, *Caulophyllum*, and *Achlys*, it deviates from ordinary dicotyledons in having irregularly arranged vascular bundles in the stem. These

genera are somewhat similar in habit and habitat. They are small genera with only a few species, and these occur in discontinuous areas in eastern Asia and North America, each occupying a more or less limited range. These plants are geophilous herbs with well-developed rootstocks and a few large palmately-lobed leaves. Most of them grow on mountain slopes at fairly high altitudes as undergrowth in deciduous forests, usually in association with certain genera of the Ranunculaceae like *Cimicifuga*, *Trautvetteria*, etc.

The range of *Diphylleia*, like that of *Podophyllum*, *Jeffersonia*, and *Caulophyllum*, is discontinuous in two widely separated regions, namely, eastern Asia and eastern North America. In eastern North America the genus is found only in a very limited area in the Blue Ridge from Georgia to Virginia at altitudes from about 1000 to 1650 meters. In eastern Asia there are two separate areas. One is in the alpine regions from central Japan northward to Sakhalin and in the Amur region on the continent. The other is in central and western China, attaining an altitude of 3700 meters. The taxonomy of the genus as it occurs in these three separate areas is in need of clarification.

The American species is *D. cymosa* Michx. The plant that is found in insular and maritime northeastern Asia from central Japan to Sakhalin and the Amur region is known as *D. Grayi* F. Schmidt. Diels (Bot. Jahrb. 29: 336–337. 1900) recorded the genus as occurring in central China in Hupeh province and named the plant *D. cymosa* Michx. He considered the genus to be monotypic, and consequently the Japanese *D. Grayi* was reduced to varietal standing. Kumazuwa (Jour. Fac. Sci. Univ. Tokyo III. Bot. 2: 346–380, *f. 1–20*. 1930), in outlining the range of the genus, considered *D. Grayi* as limited to Japan, and *D. cymosa* as being found in eastern Siberia and central China, as well as in North America. It is uncertain whether his conclusion was authenticated by actual specimens or whether it was based on earlier records like that of Diels.

On studying all available specimens of the genus from America, China, and Japan, I am convinced that at least three species are recognizable, one in eastern North America and two in eastern Asia. The insular Asiatic plant found in Japan and Sakhalin is distinct from the plant found in China in Hupeh, Szechuan, and Yunnan, and this fact is substantiated by many specimens from both regions. Numerous specimens from eastern North America have also been observed, and they prove to be of a single species. No specimen has been seen from eastern Siberia. Thus it is impossible to say whether the plant from the Amur region is the same as the insular species or the central-western Chinese species. From the point of geographical proximity it is more likely to be identical with the former than with the latter. There is also the possibility that it is a distinct species or variety. The Chinese species, hitherto unnamed, is described as follows:

Diphylleia sinensis sp. nov.

Planta perennis, rhizoma crassum, radicibus parvis teretibus, fibrosis;

caulibus singulis, carnosis, 60–90 cm. altis, leviter puberulis; foliis singulis vel pluribus, longe petiolatis; petiolis ad 45 cm. longis, leviter puberulis; lamina palmata, rotundata, apice ad medium lobata, ad 15–20 cm. longa, 20–30 cm. lata, margine distanter et valde inconspicue dentata, dentibus acutis, 10–25; inflorescentiis terminalibus, singulis vel raro paribus, elongatis, cymosis, ramis iterum dichotomis vel raro simplicibus; pedicellis 5–25 mm. longis; petalis 5, ovatis vel obovatis, circiter 6 mm. longis et 4 mm. latis, subrotundatis; staminibus inclusis, filamentis crassis, 2 mm. longis, antheris elongatis, 2 mm. longis; ovariis ovoideis, 2 mm. longis; fructu subsphaerico, circiter 8–9 mm. diametro, glabro.

CHINA. Szechuan: western Szechuan, *E. H. Wilson 814* (TYPE), July and August, 1908. Hupeh: *A. Henry 6820*. Yunnan: Mount Fu-chuan, southwest of Wei-hsi, Mekong-Salween divide, *J. F. Rock 16971*, May-June 1928, in shade of fir forest, alt. 3700 m.

Wilson 814 bears both flowers and fruits. The other two collections are fruiting materials only. The specimens are all in the Gray Herbarium.

The American species, *D. cymosa* Michx., differs from both Asiatic species in that the leaves are more deeply lobed, with the lobes pointed, and the inflorescence is glabrous. The two Asiatic species have more shallowly lobed leaves and puberulous inflorescences. The leaves of the insular species, *D. Grayi* Schmidt, are intermediate between the American *D. cymosa* and the Chinese *D. sinensis*. They are less deeply lobed than in the former but more so than in the latter. The Japanese plant further differs from the Chinese plant in its more glabrous leaves, its sessile or subsessile terminal leaf, its more branched inflorescence, its larger petals and larger fruits. In *D. Grayi*, the Japanese species, the inflorescence rises at the exact base of the blade of the subtending leaf. In the Chinese plant the inflorescence rises on the leaf stalk at a point about 5 to 8 cm. below the leaf-blade. In this respect the American and Chinese species are similar, while the geographically intervening Japanese species stands out as different from both.

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NOTES ON SOME CULTIVATED TREES AND SHRUBS. VI

ALFRED REHDER

Euonymus Fortunei (Turcz.) Handel-Mazzetti f. **kewensis** (Bean), comb. nov.
Euonymus radicans var. *kewensis* Hort. ex Bean, Trees Shrubs Brit. Isl. 1: 542 (1914). — [V. Gibbs] in Aldenham House Gard. List Surpl. Pl. 18 (1929), nom. subnud.; exclud. syn.
Evonymus kewensis Hort. ex H. A. Hesse in Möller's Deutsch. Gärtn.-Zeit. 47: 217, fig. (1932).

This form has usually been referred as a synonym to *E. radicans* f. *minima* which it resembles in habit and general character, but its leaves are even smaller, being only 5–8 mm. long, while in f. *minima* they are 8–15 mm. long.

Aesculus Wilsonii Rehder in Sargent, Pl. Wilson. 1: 498 (1913).
Aesculus chinensis sensu Diels in Bot. Jahrb. 29: 450 (1900), non Bunge (1833).
Actinotinus sinensis Oliver in Hooker's Icon. Pl. 18: t. 1740 (1887); 19: corrective note inserted before t. 1851 (1889, June). — Hemsley in Gard. For. 2: 124 (1889, March). — Pro parte, quoad folia; quoad flores = *Viburnum plicatum* f. *tomentosum* (Thunb.) Rehd.

In the corrective note cited above, it is stated that *Actinotinus sinensis* is based upon a trick played by one of Dr. Henry's collectors, and is made up of the inflorescence of a *Viburnum* inserted into the terminal bud of *Aesculus chinensis*. The specific name of the *Viburnum* is not given and that of *Aesculus* is not quite correct. There can be no doubt, however, that the inflorescence represents *V. plicatum* Thunb. f. *tomentosum* (Thunb.) Rehder in Jour. Arnold Arb. 26: 77 (1945), better known as *V. tomentosum* Thunb., a name unfortunately invalidated by the earlier homonym of Lamarck (1778). The leaves agree perfectly with *A. Wilsonii* Rehd., the only representative of the genus *Aesculus* in Western China. In the same region *V. plicatum* f. *tomentosum* is found, so that material of both species could have been collected at the same time and put together to create this fake specimen.

Phillyrea latifolia var. **media** f. **pendula** (Ait.), comb. nov.
Phillyrea media γ *pendula* Aiton, Hort. Kew. 1: 11 (1789). — Rehder in Bailey, Stand. Cycl. Hort. 5: 2583 (1916) "var."
Phillyrea pendula Willdenow, Enum. Pl. Hort. Berol. 12 (1809). — Link in Jahrb. Gewächsk. 1, 1: 159 [1818]. — Loudon, Arb. Brit. 2: 1204 (1838) "*P.* (*m.*) *pendula*."

It is doubtful if this form is still in cultivation; I have seen neither a living plant nor a recent reference to one, nor an herbarium specimen of it.

Viburnum lantanoides f. **praecox** (Kache), grad. nov.
Viburnum lantanoides praecox Kache in Gartenwelt, 16: 496, fig. (1912, Sept.).

Viburnum alnifolium (f.) *praecox* Hesse in Mitt. Deutsche Dendr. Ges. 1912(21): 371, fig. [1913].

This form differs chiefly in its flowering time which is about three weeks earlier than in the typical form.

The specific name *V. lantanoides* Michx. had been universally used as the valid name for this species until in 1898 Britton in Britton & Brown (Ill. Fl. N. U. S. 3: 229) took up the name *V. alnifolium* Marshall of 1785 and was followed by a number of botanists. Marshall's plant, however, represents only partly a *Viburnum;* it is based on Miller's *Viburnum americanum* (Gard. Dict. ed. 8, *V.* no. 8. 1768) which is mainly referable to *Hydrangea arborescens* L. This is further confirmed by a specimen of Miller's *V. americanum* in the British Museum which according to S. F. Blake in Rhodora, 20: 14 (1918) is *Hydrangea arborescens* L. The description of *V. alnifolium* Marshall is an almost verbatim copy of Miller's description without any additional new character which would indicate that Marshall did not know much of the plant he was describing, and as in almost all other cases, he does not give any reference to the author of the name. See also Mackenzie in Torreya, 27: 81–83 (1927).

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1947

DURING THE PAST YEAR many changes have occurred at the Arnold Arboretum. Dr. Merrill retired as Director on reaching the age of 70, but remains as Arnold Professor of Botany. Mr. E. J. Palmer retired at the age of 73, but will remain another year for a special part-time project. Dr. Leon Croizat and Mr. Vladimir Asmous resigned during the year. Dr. Charlotte G. Nast, Curator of the Wood Collections, left to accept a teaching position. None of the resulting vacancies has been filled. We have, however, appointed Mr. Richard Fillmore to succeed the late Mr. Judd as Propagator. Mrs. Beatrix Farrand continues to serve as Consulting Landscape Gardener.

Horticultural Activities. — During the past year nearly 4,000 man days have been spent on the grounds. The major project has been the removal of duplicate and overcrowded plants — a total of more than a thousand. Some of the extra shrubs were moved to nursery rows at the Case estate in Weston. The larger trees were cut up for fire-wood which we hope will pay for some of the costs.

Some new plantings have been made around the Administration Building where we plan to feature the introductions and new hybrids introduced by the Arnold Arboretum. A planting of ground-covers along the road will be extended along the meadow as funds permit.

The opening of vistas and opening up of overcrowded areas, as well as the new plantings has been done in accord with the suggestions of our consulting landscape gardener, Mrs. Beatrix Farrand.

During the current year 155 species and varieties of plants were propagated. We received 267 species or varieties from other institutions and distributed 283.

Photographs in natural color are made for records and for display. There is a need also for black and white prints for use in publications. We have few good pictures for such purposes.

The National Shade Tree Conference, attended by over 500 delegates, held its field demonstration in the Arnold Arboretum last summer.

The Case Estate in Weston has proved to be a valuable adjunct to the Arboretum. Miss Louisa Case died in the fall of 1946 and left additional land and buildings to the Arboretum, together with farm equipment and a substantial endowment. Approximately 46 acres of land were sold to the town of Weston for school purposes, but 145 acres remain in the Case Estates. Most of this land is suitable for experimental work.

Semi-permanent plantings of *Ribes* and *Berberis* have been started at the Case Estate together with other species which should not be given

valuable display space at the Arnold Arboretum proper. Various experimental work has been started on cultural practices and fertilizers. Some of the Bussey Institution and Cabot Foundation work is being done at Weston. The Department of Landscape Architecture of Harvard University has been given the use of an area for demonstration work.

Both at the Arnold Arboretum and at the Case Estates in Weston we are using more mechanized equipment. Power mowers, cultivators, and saws permit more work with fewer men. Weed-killing sprays, flame throwers, and a mulch of spent hops are used to control weeds with a minimum of hand labor.

The plant breeding program is beginning to pay dividends in new varieties of ornamental plants. Last spring two new forsythias, Arnold Giant and Arnold Dwarf were distributed to cooperating nurserymen. Arnold Giant is a tetraploid form of *Forsythia intermedia* produced by colchicine treatment. Arnold Dwarf is a delicate dwarf forsythia produced by species hybridization. Next spring we shall distribute a new dwarf flowering cherry of exceptional merit.

Cytogenetic studies of *Sorbus-Aronia* hybrids have aided in determining the relationships of these genera. Grafting experiments in the Pomoideae and in *Prunus* have proved to be of theoretical interest and of possible economic value. The common lilacs budded on tree lilacs continue to make good growth. This should result in our being able to grow the common lilac free of root suckers.

Comparative Morphology. — Professor Bailey has continued his investigations of the comparative morphology of various dicotyledonous families, with special emphasis upon salient trends of structural specialization in carpels. Dr. B. G. L. Swamy, a Government of India Fellow, is making a comprehensive study of the Saxifragaceae and related families, Mr. James E. Canright of the Magnoliaceae, and Mr. R. W. Vander Wyk of the Annonaceae. Mr. William Spackman, Jr., is continuing his investigations of dicotyledonous woods, with special reference to problems of identifying Mesozoic and Tertiary fossils. The work in comparative morphology has been seriously handicapped during the year by the loss of Dr. Charlotte G. Nast, Curator of the Wood Collections, who has accepted a position at the Nebraska State Teachers College at a much higher salary.

Taxonomy. — Dr. Merrill has continued his taxonomic and bibliographic work and completed his Index Rafinesquianus. His extensive Botanical Bibliography of the islands of the Pacific was published by the Smithsonian Institution early in 1947. During the year he was honored by election to foreign membership in the Royal Society of Edinburgh, the Royal Swedish Academy of Sciences, and was appointed as honorary collaborator of the Botanical Garden, Buitenzorg, Java. He also received the George Robert White medal of honor from the Massachusetts Horticultural Society in appreciation of his services to horticulture.

During the past year Professor Rehder completed his bibliography of cultivated trees and shrubs, and part of this work is now in proof. The catalogue begun by Professor Rehder, containing all available references in the periodical literature useful in the classification and identification of woody plants, now contains 144,551 cards — an increase of 3,526 during the past year.

Professor Johnston has worked on the flora of Panama, and has completed a study of the plants of San José Island. Professor Raup's "Botany of the southwestern Mackenzie" has been published in Sargentia. Dr. Smith completed a study of *Illicium*, *Schisandra* and *Kadsura* before he left, in late February, for a year of field work in Fiji. Dr. Kobuski has been busy with editorial and curatorial duties, but is continuing his work on the Theaceae. Mr. Palmer is working on *Crataegus* and *Quercus*. Dr. Perry is studying the Papuan collections made during the Richard Archbold Expeditions, while Dr. Allen is continuing work on South American Lauraceae. Dr. Frans Verdoorn is working on his Index Botanicorum, to which more than 120,000 references were added during the year.

The herbarium now contains 626,999 specimens. A total of 35,898 specimens were received by exchange, purchase or for identification. The Arboretum sent 13,046 specimens to other institutions.

The Library. — At the end of the fiscal year the library contained 46,520 bound volumes, 200 unbound volumes, and about 14,000 pamphlets. Through the Interlibrary loan system we loaned 137 volumes in addition to 435 volumes to other Harvard libraries. We borrowed 188 volumes from other libraries, including those of Harvard.

Several exhibits of our rare books were on display for the Visiting Committee, various Garden Clubs and the Massachusetts Horticultural Society visitors. With the end of the war the flow of visitors and students has increased greatly.

Among outstanding gifts were a Gazetteer of Chinese Place Names from the Army Map Service, and six volumes of Backer's Flora of Java, a gift from Dr. Verdoorn.

Financial Report. — Endowment funds received last year included $55,464.91 from the Marion Roby Case estate, $10,350.00 from the J. B. Case Fund, by sale of property to the town of Weston, $150,000.00 from the Katherine T. Balch bequest and contributions to the Judd Memorial Fund, amounting to $2,862.50 — a total of $218,577.41 for the fiscal year. In addition funds for current use totaled $4,970.25, including $2,320.00 for cultural purposes, a grant of $500.00 from the Bache Fund of the National Academy for Dr. Merrill's work, and a grant of $600.00 from the same fund to Dr. A. C. Smith. Harrison W. Smith contributed $1,500.00 for Chinese exploration work, and the publication fund was increased by $50.25.

The total income for the year was $152,409.43, while expenses amounted to $170,914.89, leaving an apparent deficit of $18,505.46. The deficit was covered by drawing on a credit balance built up during the war years, and by drawing on contributions for cultural purposes which had also accumulated during the war years.

The endowment of the Arnold Arboretum has increased more than three-fold since Sargent's administration, yet the labor and scientific personnel has not been increased materially. Costs of labor, equipment, and materials have increased almost as rapidly as has the income from endowment. The income from endowment is adequate for routine maintenance, and present projects, but new major projects must be financed by annual or special gifts.

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